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NEW YORK, Feb. 20.—Raws.—The market throughout the week has been very firm with buyers on basis of last quotations of 3 5/8c. for 96° Centrifugals, 3 1/8c. for 89° test Muscovados, and 2 7/8c 89° test Molasses sugars. All sugars offered at these prices on spot or to arrive were promptly taken. Receipts for the week amounted to less than the somewhat reduced meltings and stocks show a decrease of nearly 2,000 tons. Holders in Cuba offer very sparingly, while awaiting the action of Congress on duties, but would sell a limited quantity at 2c. c. and f. or 1.91c. f. o. b. The European markets have remained steady, closing at 6s. 9d. per 112 lbs. for beet f. o. b. Hamburg, which is the parity of 3.67c. for 96° test Centrifugals at New York. The market in Europe is supported by the large demand from England, where an increase in duty is anticipated, the stocks in the United Kingdom now amounting to 183,000 tons against 73,532 tons at same time last year. It is a question whether present prices will be maintained after the English duty is settled next month and the unusual demand naturally falls off. Reports from the Bounty Conference at Brussels indicate that Austria is willing to abolish her export bounties and reduce the import duty on sugar. It is stated that Germany is also willing to abolish the bounties. Present conditions may not be materially improved by the results of this Conference, however, as the proposed time for making any change in bounties is not until September, 1903.—Willett & Gray.

CANE LOADER.—The Hawaii Herald publishes the following description of a new cane loader and weigher: Isaac Errickson, a Hilo carpenter, has recently completed a working model of a machine for weighing and loading sugar cane on to cars. The machine is built of wood and iron and weighs about 1,600 pounds. The beam is so constructed that it will swing in a half or full circle. On the left hand end are two weights with an aggregate weight of 300 pounds. These facilitate raising or lowering the hook in handling the cane. The hook is lowered to the ground level and raises the cane to a height of sixteen feet. There are broad wheels under the heaviest part of the machine, and it can be run on the ground or on tracks. The lift capacity is 1,600 pounds and at a recent test at Waiakea cars were loaded in two minutes. The mechanism is very simple. Mr. Errickson has a patent sling that will follow each machine. It is constructed of wood and iron, with a four-foot opening. These are the invention of Mr. Errickson and patents have been applied for. Three men are required to work the loader. The machine sells at $225 to $275 and will save the labor of four men.

NEW YORK, Feb. 14.—The Brussels' Conference, which had

been adjourned to the 11th Feb., found it necessary to make a further adjournment until the 17th in order that the delegates might confer more fully with their respective governments. The prospects of a settlement, which will lead to the abolition of bounties, State and Kartell, was still uncertain, although strong hopes are entertained that the Conference will have this result. In the case of the State bounties the abolition would be brought about by direct legislation, and in the case of the Trade or Kartell bounties by reducing the import duties to 2s .per cwt., which would at once sweep away the monstrous protection that enables German and Austrian Kartells to charge consumers in those countries such high prices as to furnish a fund out of which the Kartells can pay the factories a Trade bounty, that has given an artificial stimulus to production and has led to the excess of supplies and the collapse in prices from which the commodity is now suffering. It is rumored that Germany is willing to reduce its import duty from its present rate of about 10s. per cwt. to 2s per cwt., but Austria had not yet agreed to do so, Feb. 14.

The Cuban situation in Washington has become involved with other political questions, which may cause additional delay to favorable legislation. Congress seems to fear that to grant reciprocity to Cuba at once would enable her to increase her production by importing Chinese or other cheap labor. For this reason it is held in some quarters that it would be better to hasten annexation now, so as to impose on Cuba the American immigration laws. Should Cuba secure an early reduction in the duties on her products, there is no doubt that cane plantings will be increased this spring very largely.—Czarnikow's Cir.

At a meeting of the sugar planters held in New Orleans during February, Dr. Stubbs said "that there was an Australian inventor now working in Philadelphia on the perfection of a cane cutting machine, with the view of securing the rewards offered by the Australian and Hawaiian Sugar Planters' Associations. It was the speaker's belief that a reward had likewise been offered by the Louisiana Sugar Planters' Association." This is the same party that we have before referred to, but his invention is not yet perfected.

At the Charleston, South Carolina, Exposition, the Louisiana Experiment Station of New Orleans exhibited sixty-five varieties of cane, among them being many rare foreign varities, which are seldom seen. The New Orleans Sugar Exchange furnished eighteen commercial grades of plantation sugars, nine grades of molasses and one of cane syrup. In 1900 the value of the sugar crop of Louisiana amounted to $36,000,000.

CANE JUICE WEIGHERS.—One of our island inventions, which has been in use here for some time, is proving its value by being adopted in other countries. Recently an order for several of the automatic cane juice weighers, invented and patented by Mr. Hedemann, of the Honolulu Iron Works, has been received from Australia, and in response several of them have been shipped, and will doubtless prove to be a valuable acquisition in the large and well known sugar refinery of Sydney. Some years ago, an automatic grain weigher was invented in the United States, with the result that all of the grain in the thousands of graneries in the States is weighed by them, and with vastly greater accuracy and expedition than formerly by hand. These and other similar inventions save a great amount of labor, and are far more accurate than when weighed by hand.

PINEAPPLES.—In another part of this issue we insert an article describing the mode of planting and caring for pineapples in Florida, where this fruit is raised in large quantities for the Northern and foreign markets. Pineapples may be cultivated and matured for the California market as readily here as in any tropical country; but it will be necessary to make arrangements in advance for their disposal. One drawback has been the high freight charges, both inter-island and foreign, which, however, may be reduced. A factory established here would be the more proper way to conduct the business, so far as making the preserves. There is a market on the coast for a limited amount of this fruit, and it is always preferable to supply such demand first, and only preserve what are not required for this trade. Our readers will be surprised on perusing the article to note the care that is taken in the cultivation and packing the fruit. This too, in a climate subject to occasional frosts. There is considerable difference in the value of pineapples, and certain varieties are better adapted for making preserves, while other varieties are preferred for the table. One thing is very certain, that finer fruit can nowhere be found than here.

THE METRIC SYSTEM.—An incident occurred during the year which is worth noting, as illustrating the desirability of the adoption of the metric system in the United States, which, except Great Britain, is the only important manufacturing nation still employing the old system. In August of last year the United States naval collier Scindia arrived at Marseilles, with boiler tubes burnt out, and under urgent orders to proceed to Manila. The ship came to Marseilles, as it was considered, and in fact was, the port best equipped to make the absolutely essential repairs. Every facility was offered for the prompt refitting of the boilers by local contractors, but it

was found that all the tubing in the city had been manufactured in France, and according to metric dimensions, and none of it could be utilized in the Scindia's boilers without forcing the shells. There was the variation of a hair's breadth in the dimensions, but it was sufficient to prevent the work from being accomplished, and orders had to be cabled to the United States for material, which was brought over on one of the German steamers—probably at express rates—and delivered at Naples, where the repairs were eventually carried out. The ship was delayed two or three weeks, in consequence of the fact that her boilers had been built upon a scale of feet and inches, while European tubing was manufactured according to the metric system.

Is Cuban Sugar Inferior to the Louisiana Product?—It has been stated that to produce a kind of sugar similar in character to their own all the Cubans had to do would be "to wash their sugar with some clean water." We venture to say that this cannot be done in the way proposed. Cuban sugars are of a gray, brownish color, while the Louisiana product is of a bright yellow, and no amount of washing with water, be it ever so clear, will ever transform a gray brownish sugar into a bright yellow one. This can only be done by a thorough process of refining as now in use, and even then the peculiar tinge of the bright Louisiana sugar is not produced. —Tea & Coffee.

Polishing Rice.—Fashion demands that rice shall have a bright luster and this is secured by rubbing off a dull outer coating of the grain, which has been shown to have a food value nearly twice as great as the rice grain after polishing The polishing process, however, greatly improves the appearance of the grain, and it is now almost universally practiced in cases where the rice is intended for occidental markets. The material scoured off is preserved and sold under the name of rice flour. The polishing is effected by friction against the rice of pieces of moose hide or sheepskin, tanned and worked to a wonderful degree of softness, loosely tacked around a revolving double cylinder of wood and wire gauze. From the polishers the rice goes to the separating screens, composed of different size of gauze, where it is divided into its appropriate grades. The rice is then packed in barrers or sacks and is ready for the market.—Ex.

Improved Seedlings.—The Louisiana Experiment Station last year received from Trinidad over fifty varieties of the new seedling canes originated by Profs. Fawcett and Bovell or Barbadoes. Only three of these have been found worthy of cultivation . These are Nos. "64," "74," and "95." No. 74 is

pre-eminently attractive, giving a heavy tonnage, high extraction, and large sugar content. It is a dull green cane with long joints, growing very tall and straight. It has been tested for five years on this station with uniformly good results. It gave 38 tons per acre in the field, which yielded 81 per cent. extraction without saturation, upon a nine-roller mill at the sugar house, and its juice contained about 16 per cent. sugar. So full of promise is this cane that it was sent to every planter applying for it. Over two hundred bundles were thus sent out each year.

WIRELESS TELEGRAPHY.—If my system of wireless telegraphy, says Marconi, can be commercially established between different parts of the earth, the possibility of which I may state I have not the slightest doubt, it would bring about an enormous cheapening in the methods of communication at present existing. The system of submarine cables of today fulfills the demands of communication to a great extent. But the great cost of the cables themselves and their heavy working expenses cause the existing methods to be beyond the reach of a majority of the people inhabiting the various countries of the world. But could this new method be applied, I believe the cost of what we now call cabling to England might be reduced at least twenty-fold. The present rates are twenty-five cents a word. I do not see why, eventually, with the wireless system, this cost should not be reduced to one cent a word or less.

TO PREVENT FOREST FIRES.—Representative Waters has secured passage by the House of a bill to prevent forest fires. It provides:

"That any person who shall wilfully or maliciously set fire, or cause to be set fire to any timber, underbrush or grass on the public domain, or shall suffer fire to burn unattended near timber or other inflammable material, shall be deemed guilty of a misdemeanor, and upon conviction shall be fined a sum not more than $5,000, or be imprisoned for a term of not more than two years; or both.

"That any person who shall build a fire in or near any forest, timber or other inflammable material upon the public domain shall, before leaving said fire, totally extinguish the same. Any person failing to do so shall be deemed guilty of a misdemeanor, and upon conviction shall be fined not more than $1,000, or be imprisoned for a term of not more than one year, or both.

"That in all cases arising under this act the fines collected shall be paid into the public school fund of the country in which the lands where the offense was committed are situated."

AMERICAN ADMINISTRATION IN THE PHILIPPINES.—The European press has watched the movements in our new possessions with an eye inclined to be critical; but now a voice has been raised as to the beneficial change effected in the condition of the Philippines by American rule. The central bureau for the preparation of German commercial treaties has just issued and distributed a bulletin to the German press and business circles reading thus:

Although the pacification of the Philippine Archipelago has not as yet been fully established, the accounts of its economic development are so favorable that it can not be too strongly urged upon German exporters to give particular attention to this group of islands. From July, 1900, to March, 1901, the exports have increased by 34 per cent and the imports by 52 per cent, as compared with those of the same period of the preceeding year. The testimony can not be withheld that the American administration of the affairs of the Philippines has, as far as the economical betterment of the country is concerned, already achieved extraordinary success.

In 1894, which was the last year of peaceful condition while under Spanish rule, the Philippine imports reached $28,500,000 and the exports $33,100,000 Mexican in value.

Under American rule, in spite of the continued insurrection of the natives, the imports increased in 1899 to $40,900,000 and in 1900 to $55,500,000 Mexican, and the exports to $38,500,000 and $53,400,000, respectively. Military supplies are not included in these figures.

The detailed statistics show that Spanish trade with these islands is rapidly diminishing, while commercial relations with the United States are gaining.

For German interests, it is essential to know whether imports from the United States will receive preferential treatment. Spain gave her products on importation into her colonies preferential rates. The United States hitherto has abstained from following this precedent. It is noteworthy that the tariff schedule, proposed by the United States commission in Manila, retains the present feature of equal rates on all importations, whether from the United States or other countries.—U. S. Consular Reports.

ATLANTIC STEAM COMPETITION.—The contest for speed supremacy in the trans-Atlantic passenger and mail traffic seems to have been definitely abandoned to Germany by other maritime nations, and it is now a duel between the two leading German lines, whose experience has demonstrated what had been previously doubted, viz:, that the largest and fastest ships, however great the cost of adding a knot or two per hour to their speed, are the most profitable, and are preferred by the class of trans-Atlantic travelers who are ready and eager

to pay extravagant rates for passage on lines which can cut down the transit from continent to continent by a few hours only. Of the 21 steamships of 10,000 tons or over which were afloat in 1898, England owned 6, Germany 10, the United States 4, and Holland 1. In 1901, there are 61 of these leviathans in commission, of which 26 fly the British flag, 24 belong to Germany, 6 to the United States, 3 to Holland, and 2 to France. Not only were the shipbuilding industries in Germany active during the past year, but from all that can be ascertained they were exceptionally profitable. It is stated in a leading financial journal that the aggregate dividends paid by thirteen of the largest German shipyards in 1900 amounted to 107.5 per cent of their actual capital, as against 68 per cent in 1896. One company, the Flensburg, paid 18 per cent on its entire stock; and the Vulcan Company, of Stettin and Bremen, which builds the greyhounds for the North German Lloyd and Hamburg-American companies, paid 12 per cent on its shares. Notwithstanding the troubles in Asia, which reacted more or less upon all Eastern trade, the freight carried on the subsidized lines of the North German Lloyd Company to China and Australasia amounted to 190,584 tons, valued at 180,421,000 marks, against 179,719 tons, valued at 165,268,000 marks, in 1898.

GERMAN SUGAR-BEET PRODUCTION.—The following translation from the Frankfurter Zeitung has been forwarded by the Vice-Consul-General, Frankfort, Germany: "The supervising committee of the German sugar syndicate decided at its last meeting to use its influence—owing to the depressed condition of the sugar market, which can be bettered only by lessening production—for the purpose of reducing the cultivation of beets in 1902. An effort will be made to effect an international agreement on this subject. According to the organ of the rong (The German Sugar Industry), at the meeting referred to the opinion was expressed from all sides that the decline in the price of beets will cause the planting of fewer beets in future. Time will show whether this view is a correct one. So long as the Government assists the industry with bounties and in other ways, a normal development of the business of raising beets can hardly be expected. The overproduction, which it is now desired to combat, has been artificially caused or at least encouraged."

TO SACRIFICE DOMESTIC PRODUCERS.

The proposition of the administration to sacrifice the domestic sugar industry, in order that the Cuban industry may flourish, is one of the most un-American propositions ever presented to Congress. The only excuse for this wanton disregard of the welfare of so large a number of our own people is that, as a result of the war, the people of Cuba are impoverished, and this country, having intervened in their interest, is morally bound to come to their assistance and re-establish their sugar industry, even if our own thriving sugar industry is ruined as a result.

This is a degree of magnanimity which is suspicious, to say the least. It is admitted that the Cuban sugar industry, despite our tariff and the Spanish export tax, was in a flourishing condition prior to the revolution which led to the war between this country and Spain. That revolution was not instigated by us, but was solely the affair of the Cubans. In finally going to war with Spain to liberate the Cubans, who were unable to free themselves, we placed the Cubans under lasting obligations to us, but we incurred no obligation on our own part. It is, therefore, absurd that this country is morally bound to sacrifice its own people and interests in order to restore prosperity in Cuba.

When it comes to tobacco, Cuba plays even a more important part in our imports than she does with sugar. In 1896 the total value of all tobacco imported by the United States was $16,503,130. Of this amount no less than $10,613,468 was credited to Cuba, or practically two-thirds of the entire imports. Even including the years of the Spanish war, the average of the last five years shows that Cuba, measured on the basis of value, has sent to this country quite one-half of the tobacco that we have imported, while, measuring by quantity, she has furnished in the same period more than 60 per cent. of our imports. By these figures the fertility of this island is made plain, and it is also clear that the Cuban planters have every reason to strive for reciprocity or free trade with the United States. The Cubans do not, however, as yet ask for free trade in tobacco. They evidently realize that to antagonize the sugar growers and the tobacco growers at the same time would mean the stirring up of a hostile sentiment so strong that Congress would be obliged to respect it. They, therefore, attack the question with diplomacy. Free sugar and a reduction of the import tax on tobacco will satisfy them, though it is probable that, once these are granted, they will begin a campaign for the entire removal of all duties on imports from Cuba.—N. O. Picayune.

THE SUGAR CRISIS.

In one of our exchanges appears a letter from Germany relative to the condition of the sugar market and Cuba, which contains much truth:

"Right here let us sound a note of warning to America's infant beet sugar industry. The conditions in California and Michigan are somewhat different from what they are here. For they have a ready market for their product, although of course prices will be regulated, even for them, byt the laws of supply and demand of the entire sugar producing and consuming world. Then, too, they have no need for the middle men in the sugar refineries. For you refine your own beet sugar, and place your product immediately upon the markets direct. But, nevertheless, you are in constant danger.

All this hullabaloo about what the United States owes to Cuba, and what should be done for them at the coming session of Congress, is nothing more nor less than ammunition furnished and used by the Havemeyer Sugar Trust, to stifle the beet sugar industry. Here in Germany we have long ago seen through this little sham patriotism of the Sugar Trust and their henchmen. Their actions at this time are a travesty on national honor and liberality among nations. This cane sugar trust did all in its power to bring about the war with Spain in 1898. It did this in the same ingenious way that it is now trying to strengthen its own position in the sugar markets of the world. In 1898 they scattered broadcast the stories of Spanish tyranny and oppression. They urged through the press and through Congress, immediate intervention in behalf of the much abused Cubans. Conditions were ripe then for their intrigues, and Spain was driven from the western hemisphere. Humanity at large gloried in this achievement, even if the means to the end were altogether inspired by the self-denying sacrifices which were put forward as the mainspring in that spirited action. Of course the American people at large were entirely honest and sincere in their intentions, and they did a noble act. But the moment that Spain was driven from Cuba, the Sugar Trust showed its real intentions. With a rapacity unequalled in the annals of nations, they gobbled up the forlorn sugar plantations of Cuba, which the years of the revolution had placed at their mercy. They had urged their countrymen to make Cuba free, and immediately set about to enslave the people more thoroughly than they had ever been before. For the rich plantations once owned by independent Cubans, independent as far as this world's goods went, now became the property of the ghoulish Sugar Trust, or its trusted agents. The man who once owned it, could now act as assistant for his new master. That is to a large extent the condition in Cuba today."

PROF. WILEY ON THE SUGAR PROBLEM.

At a meeting of the Florida State Agricultural Society, Prof. Wiley, made an address. He spoke for an hour on the topic of Florida as a sugar-producing State, and said, in substance:

The problems connected with the sugar and starch products are four or five in number. First of all, the soil. Agricultural interest should pay some attention to staple crops, that is, crops that have a market the year round, and can be preserved and marketed at any time.

Sugar and starch are types of such crops. These substances take absolutely nothing from the soil. They are fabricated by the plant from the atmosphere and water, hence the cultivation of such products does not tend to impoverish the soil.

The soils of Florida are largely of a sandy nature, that is, they have been deposited from water; they are typically different from the soils of the great northwest, which were produced by the grinding effect of moving icebergs, and represent the richest soils probably in the world. Sandy soils are not suitable for producing wheat, for instance, but they are well adapted to producing sugar and starch. In Florida it is more a question of climate, scientific agriculture will produce a crop from almost any kind of soil.

The second problem to be considered is that of fertilizers. Perhaps there is no state more favorably situated than Florida in respect to fertilizers. You have here inexhaustible deposits of phosphate; in the leguminous crops which grow here, namely, peas, alfalfa and beggarweed.

The third problem is the character of the market. This country is the greatest sugar and starch consumer in the world. We use more than 2,000,000 tons of sugar annually. Of this quantity, before the Spanish war, we only made about 300,000 tons, about one-seventh of all.

Since the Spanish war we have acquired Hawaii, Porto Rico and the Philippines, all of which give us large additional quantities of sugar. This year we will produce about 100,000 tons of beet sugar, so that at the present time it may be said that we produce about one-third of all the sugar we consume, but still there is a vast foreign market, which we might supply with the home product. There is no danger, therefore, of overstocking our home market with increased sugar production, nor is there danger of the beet sugar driving the cane sugar out of the market.

The sugar crop of the whole world is about 10,000,000 tons, of which nearly 7,000,000 are made from the sugar beet.

The sugar beet, can, however, not be grown in Florida profitably. Here you must depend on cane for sugar and upon cassava and potato for starch. From starch glucose can also

be made, and it seems to me that in the near future the glucose industry will pass from the Indian corn belt to the cassava and potato belt. In one particular industry Florida and the southern parts of Georgia and Alabama stand preeminent, and that is the manufacture of table syrup from sugar cane. It is important, however, to secure uniform grades to hold the markets of the world and this can only be accomplished by mixing together the products of small farmers or by the establishment of central factories, where the cane grown in the neighborhood can be manufactured under standard conditions.

By the development of these great industries table syrups, untold wealth in the near future will flow into Florida. As by-products of the factories, immense quantities of cattle food can be obtained, both from sugar cane and the starch-producing plants.

Thus a dairy industry can be established in connection with sugar and starch-making which will add much to the wealth of the state.—Flor. Ag.

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IMPENDING CRISIS IN EUROPEAN SUGAR.

It is generally recognized that the beet-sugar industry of central Europe is approaching a critical conjuncture. Germany, Austria, Hungary, France, and Russia are now gathering a beet crop which will yield an output of sugar far surpassing in quantity that of any previous year.

This overwhelming product comes, unfortunately for Germany, at a time when industrial depression and a short wheat and rye crop have seriously reduced the purchasing capacity of the poorer classes, so that a high commercial authority estimates the decline in sugar consumption in Germany alone during the fiscal year 1902 at 75,000 tons. To complete and still further darken the shadow Cuba has reappeared as a vigorous and threatening competitor in the United States, which, during the past four years, has taken an average of 283,000 metric tons of German sugar, valued roughly at 53,000,000 marks ($12,614,000) per annum.

Under all these conditions, the price of sugar has fallen in the controlling market at Magdeburg to the lowest point reached during the critical year 1894-95, from which it was rescued by an advance in the export bounty and a constantly increasing home consumption of sugar, which was then favored by prosperous industries and growing export trade, which steadily augmented the comfort and purchasing power of a large percentage of the German people. Now, however, it is generally recognized that the only remedy will be in the direction of diminished production, and the chief organ of the German sugar industry declares that a definite and important re-

striction of the sugar-beet area to be planted next spring has become an unavoidable necessity.

For these obvious reasons, great interest has been awakened throughout this country by the recent visit to Washington of the governor-general of Cuba, and the conviction is growing that, notwithstanding all doubts and suspicions, Cuba is really about to begin the career of an independent state under the generous and sympathetic protection of the United States.—Consular Reports.

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THE MOTIVE POWER OF THE FUTURE.

Years ago when our English friends became alarmed over the prospect of the exhaustion of their coal mines and the consequent destruction of their manufacturing industries, it was suggested that by utilizing the enormous tide power which might be obtained along the immense coast line of Great Britain ,a source of power far exceeding that of coal was at their disposal.

It is true that several efforts to use the power of the ocean had been made, some of them successful; but these were all on a small scale. At the time of which I speak two great obstacles stood in the way of obtaining and applying power from this source. The first was the difficulty of utilizing the power after it was obtained and the second was the great value of capital, or, in other words, the high rate of interest, which precluded the erection of works on such an extensive scale as would furnish the large amount of power required and of such substantial construction as would be necessary to withstand the severe storms that might be expected.

A tide-power plant, if installed at the mouth of a river on which any of our large cities is located, would be apt to interfere with navigation and perhaps with valuable riparian rights, while on the other hand, if located on an uninhabited part of the coast, it would be unavailing for a manufacturing establishment, unless the power could be carried inland. Thirty years ago this transmission would have been almost impossible on a large scale, if the distance were great—wire ropes, shafting and similar contrivances being the only means then available.

Since that time, however, the practical applications of electricity have been so developed that by its use power may be readily transmitted to distances which formerly seemed quite unattainable. Consequently a plant located on the sea-coast and developing a sufficient amount of power, bay be made to perform all the work that is to be done within a radius to which there is scarcely any limit. Power obtained in this way may be used to operate railroads and factories; to furnish power and light to cities and to light and heat private houses

so that all the operations of cooking, baking, etc., may be carried on without the use of coal, gas or oil.

The construction of works sufficiently substantial to withstand storms and sufficiently extensive to supply abundant power to develop the electricity required for the purposes named, would demand enormous capital, and where this is valuable, or, in other words, where interest is high, such cost would be prohibitory.

But since the invention of the steam engine by James Watt, capital has gradually accumulated to such an extent that interest has fallen so low that it is now but a fraction of what it was in former times. One hundred and fifty years ago 10 and 12 per cent. were about the lowest rates of interest at which capital could be had, even amongst the older communities, such as Great Britain and the continent of Europe. And, even thirty years ago, an investment which did not yield 7 per cent. was considered rather unprofitable. But today capital, or, as it is sometimes erroneously called, money, may be had by governments and municipalities whose credit is good, at rates as low as 2 to 3 per cent. and by private individuals for 4 or 5 per cent.

And as capital now continues to increase at a rate to which previous ages offer no parallel, it is more than probable that before one-third of the present century has passed away, owners of capital will be glad to obtain 1 or one-half of 1 per cent. for its use. So that the amount of capital that may be required in any case will be no bar to the undertaking of the most gigantic enterprises.

We need have little doubt that when that time comes, man will be able to obtain from the tides of the ocean such a percentage of that power which is now allowed to go to waste as will, when distributed by electricity to every locality where it is needed, do completely and economically the work which is now done imperfectly and expensively by coal. And since the cost of power obtained in this way on a large scale will be very low, the uses to which it may be put will be so greatly extended that social and industrial conditions will be changed to a degree of which at present we can have very little idea.

Transportation will be so cheap and so rapid that a small house in the country will be as convenient as a city flat and a great deal more desirable, and in this way the tenement problem may be solved, and the concentration of human beings, herded in close quarters in the city, more like animals in pens than human beings in civilized dwellings, will be abolished. In refined families the annoyance of dust and dirt produced by coal fires and gas light will cease; the air of our dwellings will become purer, health will be improved and longevity increased.

And, to crown all, the great number of people who will be drawn off to find employment on the works of general utility

thus established will increase immensely the opportunities for employment offered to others.

Numerous attempts have been made to utilize the power of the waves, but, except on a very small scale, this is likely to prove a failure. Waves, as a source of power, are too irregular to warrant the construction of large plants, while, on the other hand, the movements of the tides are, within certain limits, as certain as gravity and far more regular than the flow of most rivers.

For the present, of course, it is probable that steam and the water power derived from rivers will be the chief resources of power. The application of electricity has so far extended the use of water power that rivers which have hitherto remained idle are now made to light the cities along their banks and to operate trolley systems and factories.

And for some time to come the enormous deposits of coal dust which cumber and disfigure the land around the mouths of most coal mines, will be used to produce steam power on the spot, and this power being transmitted by electricity wherever it is needed, will save the expense of transporting vast amounts of crude material and will thus render its use commercially possible.

These truths must be self-evident to all earnest thinkers, and it is therefore evident that in the near future the electrical engineer will almost entirely displace the steam engineer on land. For river and ocean steamers, automobiles and other machines to which electricity cannot be readily conveyed, steam will undoubtedly continue to be used, and consequently there will always be an extensive demand for thoroughly educated steam engineers. But in the future the great field for thoroughly educated mechanics will be in the numerous applications of electricity.—Guide to Self-taught Men.

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THE SUGAR CRISIS IN QUEENSLAND.

(Bunderberg Mail.)

It will be remembered that it was decided at the meeting of the Bundaberg Council of Agriculture on Saturday afternoon last that a deputation should interview Dr. Maxwell, director of the Sugar Experiment Station, for the purpose of ascertaining his views as to what would be the result of a practical operation of the rebate of 4s per ton on white grown sugar to farmers and the sugar provisions of the Tariff Bill. The interview took place yesterday morning, and particulars of same appear below:

Mr. Aiken, in introducing the deputation, said he thought it was necessary first for him to read the letter of the Bundaberg Council of Agriculture asking that the deputation be

heard and the doctor's reply thereto. This done, he said: We, as sugar growers, seeing that we are to be compelled to use white labor instead of kanakas in connection with the work on our cane farms, and recognizing that such departure will mean a very large increase in the cost of working our farms, the Federal Parliament is seemingly disposed to assist us to do so. Now our position in connection with the matter is this, that the amount set apart by the Federal Parliament for this purpose is not sufficient. Therefore, we are desirous of asking you, Doctor, to place any information in your possession before us so that we may be clear in any action we may decide upon taking that we are treading upon safe ground. One thing we desire to say at once, and that is, that in anything we may say this morning, we have no desire, on the contrary, we wish to avoid creating any bad feeling between the manufacturers and the growers. We believe it is to their benefit as well as of ourselves if we can work in a better spirit in the future than has been unfortunately the case in the past. We, as farmers, know quite well that perhaps there have been times when we have not, through lack of information, taken a proper grasp of matters affecting the varied interests of the sugar industry, and have consequently arrived at conclusions not based on actual facts. Without taking up your time very much longer I will come straight to the point upon which we have called to get your opinion. Now this is our opinion as growers: We are told that the tariff proposals now before the Federal House, dealing with the sugar industry, are of such a nature as will not admit of the manufacturers giving the growers any benefit whatever from the protective clauses in the shape of an increased price for their cane. Now if the mill owner is to receive no increase for the manufactured article under the tariff, it is strange that some of their number should make an increase in the price paid for cane. We want to know, in view of this, if the Federal Parliament will not in their wisdom do something that will enable the mill owners to get an enhanced price for their product, and thus enable them to give us a better price for our cane. It was our view to have representations of that kind made to the Senate by the 14th instant. According to your own statement, Doctor, placed before the Federal Premier, and which was never challenged, you showed clearly that the difference in most cane countries is between 15s and 51s per week respectively. [Dr. Maxwell: Do you endorse those figures for this district?] We, as practical men, know they are correct, and we are desirous that the amount paid to us for our cane should be sufficient to make up that difference.

Dr. Maxwell: You have put your case briefly and clearly. In the first place, referring to your remark that you do not wish to cause any ill-feeling or trouble between the mill own-

ers and the growers, personally I will say that if there should be any troubles of such character between you, I could, of course not touch them. I am in this position: Where disputes occur between growers and manufacturers, I could not come in excepting as a third party, at the invitation of both. Now I will say to you, as I have said to a number of mill owners, there should be a clear understanding between both parties, since they are interdependent. The mills must have sufficient cane to keep them going, and the growers must have an outlet for their product. There may be striving before a satisfactory adjustment of the position is arrived at, but it is mutually essential that such should exist. Now to come to the main point, the question you wish to inform yourselves upon is as to what will be the results of a practical operation of the Kanaka Bill together with the sugar provisions of the Tariff Bill. That is what you want my opinion upon. Well, in the first place, we must understand what was the primary purpose of this legislation? I think it is made very clear, so clear in fact that it should readily be understood by everybody, that the object of the Kanaka Bill is to get rid of black labor from the cane fields. The object of the sugar provisions of the Tariff Bill is to furnish means to enable those engaged in the industry to put a white man in the black man's place. That is really the sum substance, and meaning of both measures. Therefore we have to ask ourselves first where are the men engaged who are to be substituted by white labor. All of them we know are engaged in the field; none of them are engaged in the manufacture of sugar as the Pacific Island Laborers' Act specially precludes their being so employed. In view of this it is clear that the white man is to be substituted for the kanaka in the growing of cane, and as a result we find a mean is provided to aid in this the two bills mentioned, namely, a bonus of 4s per ton in the Kanaka Bill, and a protective duty in the Tariff Bill. Thus it will be seen that the Commonwealth Parliament intended that the benefit should go in the main to the growers. That is the principle and purpose of both enactments. At this point we must bear in mind, however, that the object of the bills is not only to put white men in the place of the Kanakas, but also to provide for their receiving a better wage when they come into the position, or to induce them to enter upon the work.

[Mr. Watson: We will have to pay the white man a better wage than he is getting in other callings in order to induce him to do the work.]

It is also necessary for us to remember at this point that the white man in the fields would have to receive a better wage than he is receiving today. Then the question arises, will the white men in the mills be content with their present compensation? If not, and that, I think, is a fair assumption, then some relatively small proportion of the monies provided

by the Commonwealth legislation will have to go in the furnishing of a higher compensation for the mill hands. Therefore, you see the question is not so much between the white farmer growing cane—the master farmer as I would call him—and the master mill owner who manufactures the cane into sugar. It is more a question of the white men in the field and the white men who work in the mills. But I have no doubt at all that it will eventually resolve itself into a question of the cane grower on the one hand and the mill owner on the other, and this is the point we will consider the question from now.

I have already stated the object of the Commonwealth legislation, namely, to get rid of the Kanakas and enable the growers to replace him with white labor. The question now raised is this: Will the benefit of this legislation go to the grower or not? If you do not get the benefit, then there is no doubt in my mind that you simply cannot replace the Kanakas by white workers. You get the benefit of the bonus at once, that goes direct to you—it is yours according to the principle and purposes of the Act. Then there is a duty of £6 on cane sugars imported into the Commonwealth and £10 on beet. We can therefore dismiss beet sugars from our minds altogether as I do not think it is at all likely that a single pound of beet sugar will be introduced into the Commonwealth in the face of so heavy an impost. The general view taken in the South by legislators, commercial men and others competent to judge of the situation is this: That so long as we produce no more sugar than we consume the prices of sugar are not only not likely to go down, but they of necessity go up. Whether the price will rise to the full amount or nearly to the full amount of the duty that is £3—as the other £3 is wiped out by an excise, as you know—I am not prepared to answer one way or another, but all responsible men with whom I have spoken do not foresee any reason why the price of sugar, independent of the duty, should go lower than it is today. And with the advantage of the duty on foreign grown sugars they do not see why that made within the Commonwealth should not rise from £2 to £3 per ton. As I have already said then the price of raw sugars of .88 net titre must rise considerably, and if they do not, then the whole purpose of the legislation of the Federal Parliament by which they are endeavoring to help the cane grower to put white laborers in the place of black men will be a failure.

Dr. Maxwell then touched upon the question of analyses of cane and the method to be adopted to secure accuracy on this head. A certified polariser will be maintained at each mill, and all cane showing a sugar content of 10 per cent. will be entitled to a rebate of 4s per ton. If the sugar content were more a greater rebate would be paid, and in really high quality cane it would, he said, be possible to obtain as much from

high polarization as 5s or 6s per ton rebate. If the sugar content dropped below 10 per cent. of course the 4s rebate would be reduced. Again it would interest the deputation to learn that the analyses of the certified polariser might also be used at providing a basis of payment for cane between grower and mill owner. This would mean that cane would be paid for in accordance with its value. That would have a powerful tendency to induce growers to grow first class cane, so they would see Federal legislation had played into his hands quite anonymously. * * *

Mr. Tutin: The industry cannot survive unless some benefit is received by the growers from the tariff.

Dr. Maxwell: I don't mind telling you that I have the gravest doubts as to whether the sugar industry will pull through. In the north I feel sure it will be completely paralysed—paralysed to death, in fact. In Bundaberg if the price of sugar be increased in keeping with the duty provided by the Federal Parliament, and that duty is distributed within the industry, the main proportion going to the growers, we might make a fight for existence. But the duty was really passed, they must bear in mind, to benefit the white laborers—they as working farmers if they plowed or worked in the field in other capacities would, of course, get their share of the increase, but the primary object of the legislation was to benefit the white laborer—the master farmer and mill owner were not considered in the matter at all. The farmer was only intended to feel its benefit just as he worked in the field as a worker. Bear in mind the sole purpose of the two enactments is to get rid of the black laborer and put a white worker in his place. You will notice that throughout my reports to the Federal Premier I made special reference to the 2600 farmers who were engaged in growing cane, but nevertheless in the arguments in the Federal Parliament the only people recognized were the white laborers, who were to replace the Kanakas. In my argument to the Senate I said: "It has to be understood, however, that the white field laborers now on the land, and the white farmers, who are also laborers, will have to participate with the 1912 white laborers who shall have taken the place of the Kanaka, in the distribution of the balance of .150,000. Nevertheless, that balance is probably capable of raising the white man's field wage all round from 10s to 12s per week, providing the farmre does not expect more value from the bonus than the addition to his wage, as a laborer, that will come to hired labor; and providing that the mill hands do not claim to participate in the claims." And again, "but, as in the case of Bundaberg, the white laborers now on the ground, and the cane farmers themselves, will have to participate in the distribution of the balance. When this is done, it is estimated that the sum of £27,000, calculated to be left over after the Kanaka has been displaced by the

white man, will not raise the weekly earnings of the white field laborers all round more than 4s per week; and even that increase will be provisional upon the cane farmers not expecting any direct and larger money value for their cane, and upon the further condition that higher wages will not have to be paid to mill hands." Much surprise was expressed at this by those present, and the statement drew from Mr. Aiken the remark that the sugar industry was on a very unsound basis, and from Mr. Tutin that is was a failure. This latter remark gave Dr. Maxwell the opportunity of reminding the farmers that they had not done their duty by the industry. He said two years ago when he visited Queensland he told the growers that they had impoverished their land, and until they restored it, and went in scientifically for cane cutlure, they could not expect satisfactory results.

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TEA RAISED IN SOUTH.

Even after President Roosevelt and the Cabinet have been informed by Secretary Wilson that in South Carolina the finest tea in the world is grown, there is little known about this industry that promises fortunes as well as good tea for Americans. The latter, according to Oriental standards, they now never get.

While experiments will probably be continued for years with different teas under widely different conditions, the most important facts about tea culture in America have already been demonstrated. It has been proved that a number of kinds of tea from different countries—Formosa, Japan, China, and Siam—can be grown with profit; other kinds have been found unprofitable in a commercial way. The experiments will continue along this line and also with a view of getting the greatest productiveness from the tea plant in the least possible time. Another important point demonstrated is that the tea bush can survive very cold weather. While it is better that it should grow where mercury does not fall below 25 degrees Farhrenheit, yet in the freeze of two winters ago the tea gardens were subjected to a temperature below zero and suffered little damage.

In the East, where tea grows naturally, the rainfall, particularly in the summer, is from two to three times as much as here; this deficiency has been compensated for by having gardens irrigated. The careful labor needed for picking the deli- the little negroes in the vicinity who will take advantage of the little negroes in the vicinity who will take advanatge of them, and these children are, during school hours, instructed in tea picking. Then during the season they are given remunerative work.

Experimenting with tea was begun at Pinehurst, near Summerville, in 1891, by Dr. Charles U. Shepard. This was sev-

eral years after the government had failed to get results from an appropriation made by Congress for experiments in tea culture. Dr. Shepard's work proved successful, and recently he has received the kindest interest and pecuniary assistance from Secretary of Agriculture Wilson and from Congress.

In speaking of the only tea farm on this continent, Dr. Shepard said: "Among the most important results of the work of the past summer has been a clearer distinction between what is probably profitable and not. It was fully recognized from the outset of the Pinehurst investigation that their industrial value must rest on a clear demonstrable pecuniary profit. Nevertheless, as an experiment station, it was proper to institute numerous trials with different seed under varying conditions.

"The most common objection to the plea of the establishment of an American tea industry," continued Dr. Shepard, "is the difference in the price of labor here and in the Orient. But with a full appreciation of its force as applied to poorer grades, there has always appeared to exist a good profit in the production of those higher grades in whose cultivation and manufacture cheap labor plays a minor part. And the home production of tea has this advantage, that the final drying of the leaf need not be carried to the same extreme heat, whereby a sacrifice of much that is agreeable and beneficial necessarily follows.

"Among the experiments, the cultivation of tea in gardens protected from the direct sunlight by matting has proven quite successful so far as quality goes. Whether it will be possible to produce a tea commanding tenfold, or more, the price of that grown in the open, as in Japan, remains to be solved, as also how great must be the expense of the additional labor an outlay. Years may elapse before there shall be a demand in the United States for teas costing $10 a pound and upward, as in the far Orient, where such prices are not infrequent."

Dr. Shepard said in this connection that the finest green teas are sold in the East sometimes as high as $50 a pound, when the tea exported to America sold at the ports for about 15 cents per pound. Foreigners could not use this tea, whether or not they were willing to pay the big prices, because it would not bear transportation. Continuing, he says:

"Other things being equal, the cost of tea depends on the amount of skilled labor expended upon it, but chiefly on the 'fineness' of the leaf plucking. To pick at Pinehurst only the Pekoe tips, which are as yet unfolded leaf at the end of the young shoot, might cost $10 per pound of dry tea; to strip the leaf by wholesale, as is done during the great early summer crop in China, would cost but a few cents per pound. It is the fineness of the plucking that chiefly determines the value of the product.

"The introduction of modern tea-making machinery (invented principally at Pinehurst) has improved the cup qualities of Pinehurst black tea and rendered entirely unnecessary the digest so often expressed by Oriental travelers at the unstinted blending of human sweat in the laborious manipulation of the tea leaf in often superheated factories. The Pinehurst product passes from one mechanical treatment to another with the least possible handling, and the pure coler notable for its uniformity and especially for the pre-eminence among other teas in fragrance and delicacy, and yet by no means lacking in strength."

Special trials have been made on certain areas with both black and green teas, and the results, although these gardens in a year or two are expected to double in productiveness, are already profitable. There is a steady demand for all the black tea produced at the rate of $1 a pound. This tea is grown from an exceptionally fine seed procured from China. It cannot stand transportation for long distances, and retails in the province in which it grows for $1.60 a pound. These gardens will produce 300 pounds of tea a year, and a profit of 20 cents a pound would pay about ten times more than good cotton land. Dr. Shepard has sold some tea, so fine as to be almost dust at $12 a pound.—Exchange.

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THE SHIPPING OF MANGOES AND THE REASON FOR THEIR ABSENCE IN THE MARKETS OF THE UNITED STATES.

By John W. Harshberger, Ph. D., Philadelphia.

The traveller from temperate countries in first visiting the tropics is naturally much impressed with the large number of new and untried fruits which he meets with on every hand. He tests them all, and after his experimentation has gone on for some time, he generally reaches some conclusion as to those fruits which suit his fancy best. Almost universally, the mango is chosen as one of the most desirable of the "new" fruits tried. If this is so, why do we not find the mango for sale in the fruit stores, markets, grocery stores and fruit stands of the cities and towns of the United States? It is due, one reasons, if not familiar with the facts, to the imperfect or decayed condition of the mangoes when they reach the northern ports of consumption. Is this so, or is the scarcity of this delicious tropical product due to the lack of energy and business capacity on the part of tropical agriculturists?

This article is written as in part an answer to the above questions, and is based upon actual experiment—the writer having recently visited Haiti and Jamaica on a botanical ex-

cursion. A little history will be of some help in this discussion. According to the Pomologist of the United States Department of Agriculture (Bulletin 1, Division of Pomology): "No fruit stood higher in the popular esteem of people in parts of South Florida than the mango. When the disastrous freeze of January, 1886, occurred, every, or almost every tree north of Fort Myers was destroyed. In 1884, 126,968 mangoes were shipped from Jamaica to the United States and brought $900. In their eighth year from seed two Florida trees bore 19,000 fruits. Some of these fruits weighed a pound. Mangoes were shipped to Chicago and brought 60 cents a dozen." So much for the history of the first introduction of the mango, as a fruit, into the markets of the United States.

The experiment to be described was conducted by the writer during his return from Port Antonio, Jamaica, by steamer to New York, and thence by rail to his home in Philadelphia. A number of different sorts of tropical fruits were bought by special arrangements on Monday, July 22, 1901. The list of picked fruits, etc., as packed for a shipment, comprised plantains, pineapples, oranges, limes, mammee-apples, yams, breadfruits, guava, papaws, sour-sops and mangoes. In one box, or crate, no especial care was taken in the packing—all of the above named fruits, etc., being nailed up together for transportation. In another box, the mangoes were each wrapped in a piese of newspaper, and carefully packed away in a rather close and partially ventilated case. Two dozen, or more of these fruits in the green state were thus shipped, along with the others to Philadelphia. An inspection of the open, well-ventilated crate, when two days out at sea, revealed the total collapse of the breadfruits and the sour-sops, which had become soft and mushy, and were consequently thrown over board. The other fruits carried well—the mangoes best of all. Those mangoes packed in the open box were all more or less in a mellow condition, while those in the closer box, (wrapped with paper) were firm and sound, although fully ripe. In all cases the fruits of the common sort, "the turpentine mango," were found to have changed from the green of unripeness to the golden orange of the fully ripe mango. Ten days elapsed before the boxes were opened, so that the test made fully establishes the possibility of shipping mangoes to the larger cities of the American Republic. It should be borne in mind, that the test was a severe one. Without a doubt, the mangoes had been collected the Saturday before the writer sailed, July 20th, and kept over Sunday until Monday, when they were bought and packed. The steamer sailed from Jamaica Tuesday afternoon, July 23rd, and reached New York Monday morning, July 29th, where the boxes were expressed to Philadelphia, reaching the home of the writer on Tuesday afternoon, July 30th. The last

mango was eaten on Sunday, August 4th, so that fully fifteen days had elapsed from the time of gathering until the date of final consumption.

No doubt a variety of mango can be found, or selected, which will carry even better than the ordinary kinds sold by the negro women in the markets of Jamaica. From information gleaned from Mr. William Fawcett, director of the Botanic Gardens, and from Mons. Charles Patin, Consul General of Belgium, to Colombia, the writer believes that the finer varieties of mango are not known in cultivation in Jamaica, but are only to be found in experimental grounds and in botanic gardens.

Two elements are, therefore, needed to make the cultivation of mangoes, a profitable undertaking. The first thing necessary is a suitable variety of mango—one that has little fibrous material attached to its seed, one that will carry well and last a long time, and one which is juicy and possesses that delicious turpentiny flavor. The second requisite is a company to push the cultivation, and who will see to its advertisement and general introduction into the markets of the United States.

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ELECTRICITY'S SERVICE TO MAN.

In the North American Review for November, Anthony N. Brady summarizes in a direct and impressive manner the various blessings electricity has brought to modern life, as follows:

The waterfalls have been at work for untold ages. Within a generation man has harnessed their force, converted their energy into electricity, and compelled nature to do the work of the world. In thirty years electrical science has advanced from the field of discovery and invention to practical application to the arts and industries, developing a tiny laboratory spark into a powerful agent which moves the wheels of industry and commerce. The telegraph and the arc light were known before; but the telephone, the electric railway, the incandescent lamp, and the electric motor have been used only within a generation.

Electric cranes and hoists would build the Pyramids today with ease and dispatch. The thousands of unskilled workmen who actually wore out their lives in that monumental labor of dead ages paid the penalty of ignorance.

Economy and concentration of effort are the lessons of the twentieth century.

The automobile truck, wheeling tons of dead weight from place to place, under the guidance of a driver whose only labor is to pull a lever, is an example in everyday life of an electric machine doing safely and economically work which

was but recently the wearisome task of man and beast. Merchandise will soon be collected by electrically-operated express wagons, transferred to electrically-propelled freight cars, and whirled from New York to Chicago at a speed of ninety miles an hour, over trunk lines whose problems of electrical equipment and maintenance will have solved themselves.

Traction and lighting are the two applications of electrical energy to everyday life which are most in the public eye. Twenty years ago there were no electric cars in the United States. The application of electricity to trunk line railway traction is believed by many experts to be a development of the near future.

Possibilities of Electrical Traction.—Of course, the enormous investment represented by the steam locomotives of the trunk line railway systems must be borne in mind in considering this substitution of electrical traction. But to my mind the most important consideration in the profitable use of electricity on trunk line railways is the necessity for dispatching frequent trains made up of a smaller number of cars, instead of infrequent trains made up of a larger number of cars. The latter is the steam railroad method, by which each train pays for itself. The electrical plant, representing a great, continuing investment, would be earning no return at all, except while trains were in operation. The more trains run, whether consisting of one, three, five, or any number of cars warranted by the demands of the traffic, the better the return on the investment. The same reasons which would supersede steam by electricity on railways would render the superseded locomotives comparatively useless elsewhere.

One of the most interesting of the electrical traction systems now in operation is the elevator service. Every great city has thus its vertical, as well as horizontal, passenger railways. Cars that are hauled up and down the streets are today scarcely more essential to the business life of New York City than are the cars propelled up and down the elevator shafts of tall buildings, which have been referred to as a traction system on a grade of 90 degrees. There are in New York more than 2,000 electrically-operated elevators, using more than 15,000 horse-power.

Its Diversified Applications.—Electricity confers one of its greatest benefits on man by furnishing him the most perfect and the most useful light known. Under ground and under water, at midnight and at midday, in the street, in the workshop, and in the house, this light is made available by various ingenious devices. The incandescent lamp has, indeed, been perfected until its light may now be modulated comparably with that of an oil lamp or gas jet. The lighting effects, which were conceded to be one of the most striking features of the Pan-American Exposition at Buffalo, were pro-

duced by small units of lights—eight candle-power incandescent lamps—instead of the usual method of arc lamps of high candle-power.

The growth of electrical industries interested President McKinley. In his last speech, delivered in Buffalo on the day of the tragedy, he spoke of the necessity of the construction of a Pacific cable. Electricity was called promptly in to minister to the comfort of his sickbed. When the physicians in attendance thought the temperature of the sick-room should be reduced, an electric fan installation was effectively cooling the air within a few hours. On the same day, a long-distance telephone message from the Milburn residence in Buffalo to the Edison laboratory started on its way from Orange, N. J., under the great electrician's own supervision, the best attainable Roentgen-ray apparatus, which was received in Buffalo the next morning.

In many of the cotton factories of South Carolina, where labor is cheap, the most economical power is derived from neighboring water course,s the spinning machinery being operated by electric motors. In the armor-plate factories, electric cranes pick up great masses of steel, and silently shift them from the furnace to the rolls. Electric drills pierce the earth for coal and metal-bearing ores. The ores thus extracted are crushed by electricity and refined by the same agency. Into the irrigating channels of the arid regions of the Southwest, water from the distant hills is forced by electrical pumps. The water we drink is purified by electrolysis. Electro-chemistry is preparing many of our drugs and supplying many chemicals used in the arts. In all the domain of physical science, the most minute and accurate measurements are those made by electrical apparatus; and the electric current distributed by supply companies is measured and paid for on the indications of accurate and efficient electric meters.

The public mind is already so accustomed to the successful performance of almost prodigious tasks by electrical appliances that no special attention is aroused by the construction today of electrical plants which would have amazed the world a few years ago. Such, for example, are those of the New York Edison Company, the Metropolitan Street Railway Company, and the Manhattan Railway Company, in which enormous boiler plants generate steam for operating engines of great power, all whose force is pent in producing electricity for generating heat, light, and power.

$4,000,000,000 Capital Invested.—In telegraphy the Western Union and Postal systems may be said to represent $150,000,000, employing 100,00 people. Every railroad system has its telegraph lines. The ocean cables, in which there is a good deal of American money invested, approximate 200,000 miles. There are 800 cities with fire telegraphs. It is within

bounds to say that a total of $250,000,000 is invested in telegraphy.

From the time of Bell and Gray, in 1877, the telephone business has grown to $400,000,000. The Bell sytem alone is declared to represent $200,000,000, with 2,500 exchanges and offices, and 1,700,000,000 connections a year. Its exchanges have over 26,000 employees.

In electric lighting, the capitalization of central station companies, isolated, municipal, and ship-lighting plants, reaches $1,200,000,000. There are nearly 3,000 companies, with obligations of about $750,000,000, of which half is bonded. There are not many less than 36,000,000 incandescent lamps connected, while more than 600,000 arc lamps are doing duty. Central station earnings have been estimated at over $50,000,000. Electric lighting employs about 150,000 people.

Electrical street railways represent a capitalization of nearly $2,000,000,000. In 1897 they were earning $150,000,000 gross, and 220 of them showed, in 1898, $130,000,000 gross earnings, at which rate the earnings of electrical street railways of the United States were $180,000,000 in 1900—say 4 per cent. on the entire investment. Their employees number 150,000.

It is etimated that over $100,000,000 are invested in electric mine plants, $150,000,000 in power plants, and about $50,000,000 in electroplating establishments.

The grand total of $4,000,000,000 invested in electrical industries in the United States has been materially increased in the year 1901.—Am. Grocer.

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MAKING THE SOIL DEEPER.

The size of a piece of land is usually reckoned by its surface area for farming purposes. But every farmer understands that what may be grown on it, and his success in producing a profitable crop, depends more on the depth of its tillable and fertile soil than on anything else. When a farmer proposes to improve his land his first thought is to deepen the fertile soil where the crop mainly feeds. Most of this is naturally near the surface, where for ages nature has deposited leaves and other organic substances to make vegetable mould by their decay. If the subsoil contains potash and phosphate it will probably be heavily timbered, and the accumulated deposits of vegetable mould will be large. On sandy or gravelly soil, where only scrubby plants grow, there is little vegetable mould. These soils are always well drained and the air so freely penetrates them that all the vegetable matter burns out as rapidly as it accumulates. Such soils will be ruined by deep plowing, unless it is accompanied by heavy dressings of stable manures and frequent seeding with leguminous plants. On the other hand, according to the

American Cultivator, the heavy soils are usually naturally rich in mineral fertility, though only that near the surface, and subject to the mellowing effects of cultivation, is available for the use of crops. Where grain has been long grown, it exhausts the mineral fertility to the depth of the plowing, and it is a common expedient on such land to plow an inch deeper, and thus bring up new soil to the surface to be mellowed, and fitted for crops by cultivation and by the disintegrating force of atmosphere action and storms. But unless some stable manure is used as a top-dressing, and mixed with this subsoil brought to the surface, its effect is quite as likely to be bad for the first year, even for wheat, which probably needs more phosphate than any other of the grains, perhaps excepting oats. A deep plowing for wheat, which brings some of the subsoil to the surface, is nearly always beneficial if the plowing is done early enough to allow the subsoil to be mixed with the surface soil by cultivation. Besides, exposure which this subsoil gets, helps to make its mineral plant-food available. But on no account should land be plowed deep in spring for the purpose of deepening it. No spring crop can thrive in soil that has been for the first time brought to the surface. This is especially true of maize, which loves warmth, that is best found in decomposing vegetable humus, and that needs no mineral manure excepting potash. The cob of the maize contains a good deal of potash, and its grain has some nitrogenous matter, but it is more largely carbonaceous than any of the small grains, and the carbon of maize in stalk and seed is taken from the air through its broad leaves. When maize exhausts land, it is because it leaves the ground open to have its fertility washed away by rain, or blown away by winds, and not by what the crop takes directly from the soil. If maize can be followed by a seeding of something that will cover and protect the ground in winter, and plowed under in spring, the loss from washing and blowing of surface soil after this crop will be lessened. But there should be every second year after maize has been grown another crop that will not only restore what has been taken from the soil, but whose roots will reach into and ameliorate the subsoil. Subsoiling and under draining are the necessary means for deepening fertility on all heavy soils. Near the surface the soil is constantly exposed to atmospheric action. This reduces the soil to a fine tilth, especially if the land has been underdrained, to allow the surface water to pass off. It is because subsoiling and under-draining allow the air to go deeper into th subsoil and mellow it that they are so beneficial. On a subsoiled and drained soil crops will be heavier, and do better in hot, dry weather, than on soil that has never been worked deeply. All heavy and wet lands, from which good crops are expected, need to be under-drained as the first step towards deepening the fertile soil. Until surplus water is removed the

subsoil rmains cold, and whatever fertility it has is unavailable.

STIRRING THE SUBSOIL.—About this time last year the Melbourne Leader reprinted from Farm and Fireside an article detailing the advantages to be derived from stirring the subsoil and fining the surface soil.

"It is not so much," said the writer of the article mentioned, "that the plows and harrows of today cannot prepare a soil properly, but the inversion of the soil by the plow, and the smoothing of the surface by a harrow deceive us in regard to the thoroughness of the preparation, and hurried sowing is done before the ground is really ready for the seed. But we are learning to put more work on the land than was thought necessary some years ago, experience proving that it pays, and to meet our wants there are harrows of special kinds, attention of late being given to those that do the work with something of the thoroughness of the spade in the garden. It is mixing of the soil and airing of the particles that is needed. The plow inverts or sets the furrow slice upon edge, but it does little stirring or mixing. The smoothing harrow on these furrows make a pretty surface, but it does not make a good seed bed in any except very loose and porous soils that crumble finely at the touch, and admit air without stirring. The clay, the clayey loam, and other compact soils require thorough stirring and mixing, no matter how smooth the surface may be. Compact pieces of soil find a resting place in the bottom of the furrow, and are not aired and ground up so that their rough plant-food can be made available. The man who uses a big disc harrow will find at a depth of about three inches that the compact soil is untouched, and even most plowed lands do not have on the average over half the depth of the plowed soil stirred, mixed, and fined. The under side of the furrow slice cannot be harrowed after the plowing is done. A few thorough farmers are learning to stir this part of the ground before it is turned by the plow, when the soil will permit. A disc harrow, properly weighted, is run on the surface before the plow, and when the plowing is finished the under side is pretty well harrowed. Not only that, but the furrow slice crumbles much better in the plowing, and less work is needed after the plow. The added expense is not so great as it would appear. But even if the harrowing before the plow, fining the ground that would go out of reach of the harrow, were wholly additional expense it would not matter if there were profit from the work, and we are surer of profit from thorough going of the seed-bed than we are from any other farm work that we engage in as a matter of course. Mixing and fining mean more fertility and moisture.

"Harrows belong to two classes, those that act like a plow, loosening and tearing into pieces, and those that slice and fine the soil. I like the disc harrow. The usual objection to

it is that it makes heavy draft. When that is due solely to the huge amount of stirring it is doing, the fault is a good one. A more serious objection is that earth will often get in to the boxing, and add to draft without doing aught but harm. Another objection to many makes is that when discs are set to run deep there is weight at the end of the pole, sinking the draft on the horses' shoulders. But that is a wholly unnecessary fault in construction that all manufacturers could obviate by use of an independent pole that would serve only for guidance, the draft being attacked directly to the frame. For some kinds of work the 'in-throw' is best, and for other work the 'out-throw' is desirable. Everything considered, I prefer the 'out-throw,' but believe that the 'in-throw' is in more general use and popular. The spring-tooth harrow does grand work in tearing and mixing, but it cannot be run as deep as a disc. Where there is nothing in the way the spring-tooth does nearly perfect work, and I like especially its action in bringing clods to the surface to be pulverized with a log drag. Harrows of the 'Acme' type both pulverize and smooth the surface. They should not be regarded as competitors of the disc, but fit into use after the disc. Such a harrow is superior to the ordinary smoothing harrows, because it pulverizes more effectually. But a modern spike-tooth harrow is capable of doing lots of good work. The teeth can be set at the needed angle, and the harrow covers ground rapidly on account of the width, fining the surface, and killing the weeds that are starting under the surface. There should be good breadth and weight. Such a harrow holds its course better than a narrow and light one, not sliding around on hard or solid places."

A Victorian farmer, Mr. Drakard, in commenting on the above, expressed the opinion that for the purpose of thorough preparation of the surface and most effective and economical treatment of the subsoil the disc plows now coming into such general use in Australia are about the best implements that can be used.

Another Victorian wheat-grower, Mr. John Cock, of Broadmeadow, discussing the subject, pointed out that while no one could question the desirability of thorough preparation of land for wheat, the grower had to consider how the best results could be achieved at the least possible cost. He agreed with Mr. Drakard as to the utility of the disc plow for the purpose, and his opinion was based on three years' experience of that implement. Although, as had been pointed out by the Leader, the disc plow was not exactly a subsoiler, its action in the subsoil is such as to loosen it and to leave it open, especially in the tough clay land which he was working. The old style plow leaves a hard pan which is felt in the next plowing, especially in dry weather, but after the disc, no hard pan is met with, for the reason that the portion of the disc

that does the deepest part of the work breaks and tears the furrow from the bottom, which has a loosening effect on the subsoil. Anyone following such a plow once around a paddock would not further question the value of it as a subsoil loosener. But its advantages went still further than that. It was possible to plow in old land 7 or 9 inches deep, and bring little or no subsoil to the surface, the soil being mixed according to the generally approved method, but better, and for a fraction of the cost as compared with mouldboard plows and a multiplicity of harrowings.

Summarising his reference, Mr. Cock says: "I submit that the work done by the disc plow—that is, deep work—is quite equal to subsoiling, as you get a seed bed of loose earth 8 to 10 inches deep, and only those who walk after this plow at work will believe how loose and spongy it leaves the ground, so that the air has free access to the finely divided soil. In very few subsoiled padocks is the tilth deeper than this, while the cost of doing it is three times as great. This plow has been to me a great help, giving better crops (the best in the district), and has effected a saving of nearly one-half in the cost of putting in the crop; and my paddocks are as clean and in good heart as they have ever been. With two of these plows (five furrows each) I have done all my cultivation, and I am more than pleased with the result; nor do I think it necessary to look further afield for a more satisfactory implement."

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A NEW PROCESS OF REFINING WITHOUT ANIMAL CHARCOAL.

By Sigmund Stein, Manager, Sugar Refinery, Liverpool.

Having received many enquiries of late regarding this process, the writer is induced to give a few more details on the subject than were given in previous numbers of the International Journal. It may be stated that the principles involved are pretty well known, and in the following lines will be found some more details, so as to enable those interested in the matter to form their own opinion.

The process is entirely chemical and it achieves exactly the same result as the earlier existing processes with animal charcoal. The lowest kind of cane sugar with a polarization of 70 upwards can be treated and very white crystals, cubes, granulated, and superior "Golden Syrup" can be made thereby.

The cost is but one-third to one-half that of the old charcoal process. Of course the expenses and cost of refining depend to a large extent on the locality of the factory, the cost of labor, carriage of chemicals, etc.

The chemicals used can be easily procured in any part of the

world or can even be manufactured by the refiners themselves. It is not necessary that a trained chemist should supervise the work.

As is known great difficulties are encountered by sugar manufacturers in the tropics in getting trained chemists who are capable of acting as managers of their works, but as the principles of this process are here laid down clearly I don't think these gentlemen would have any difficulty in executing same. In this process there are four operations:

I.—The Melting and Application of Chemicals.—This is done in a high melting pan provided with a double bottom fitted with a system of steampipes and provision for the application of compressed air. This pan must be so arranged that the chemicals which are employed can be economically and efficiently used. The raw sugar is thrown into this melting pan, dissolved with hot water, and brought to a temperature of 180-190° Fahr. The concentration of the sugar solution should not be higher than 26-27° Baume at the temperature mentioned. The acidity of the sugar solution is taken and noted, and on this acidity the addition of the chemicals depends.

After the boiling is finished and the sugar properly dissolved by means of steam and compressed air, either peroxide or hydrogen, phosphate of alumina, or phosphoric acid, tannic acid or a tannic compound, calcined magnesia or another magnesia compound, are added.

Of course the addition of these chemicals and the mode of applying them has been the subject of tests on my part during the last 15 years and it is evident that the quantity and mode of application depends on the character of the raw sugar melted.

After the aforesaid chemicals have been added there will be a small froth formed on the surface which has to be taken off by means of a perforated ladle, after which sulphate of alumina is added.

It may be stated that all these chemicals are brought into the melting pan in solution or in a dissolved or suspended state at a certain degree of concentration and care must be taken that not more than a certain quantity of chemicals are added.

After the addition of sulphate of alumina, compressed air is again forced through the liquid and another froth containing the gummy and pectine matters forms on the surface of the solution. This second froth must be taken off very carefully. Steam is again applied to keep the temperature at 190° Fahr. The solution so prepared in the melting pan is passed on to the next stage—filtration.

II.—Filtration.—This can be done either through Taylor filter-bags, filter-presses, or sand-filters. Care must be taken

that only perfectly clear liquor comes out of the filtering apparatus. It is of the utmost importance to keep this filtration stage under efficient supervision. The clear solution running off from the filtering apparatus is treated now in the third stage.

III.—Boiling.—For the purpose of boiling, high vacuum pans are used, provided with a stirring arrangement, fitted inside if possible.

Regarding the material employed in the construction of the pans, I may state in answer to repeated inquiries that iron vacuums will do quite as well as copper, as the acidity is so slight that it will not affect the iron.

The boiling takes place in the case of low sugars (such as Jagary, Java stroops, Muscovados, Peru syrups, Argentine syrups, Mexican syrups, Philippine syrups, Taal, Manila, Mauritius, or Egyptian syrups), at a temperature not higher than 135-137°, and the pressure should be about 10 to 12 lbs., and the vacuum proper about 27-28 in. The boiling must be done very carefully, and all false grain prevented. It is necessary to seed the vacuum with crystals from a former strike, so as to allow large crystals to form. The sugar thus boiled is ready for the fourth stage.

IV.—Centrifugalling.—The massecuite running off from the vacuum pans is passed into large mixers, and from thence to the centrifugalling machines. Any centrifugal machine will do for this purpose, but of course the newer types are preferable. It should be a quick running machine with an arrangement for steam. The massecuite should not be too still, and the load in the centrifugal must not be too heavy. The massecuite is placed in a running centrifugal machine, the green syrup is machined off, and steam is applied for a few minutes, after which the operation is finished, and white and dry sugar crystals result, which are ready for packing. The crystals resulting from this process are equal to those made by the older process with animal charcoal.

From the foregoing descriptive lines it will be seen that no great mechanical changes are necessary to enable existing refineries to adopt this process. The expenditure for mechanical appliances is practically nil or very small indeed, and the only outlay will be for chemicals, and everyone interested in this process can easily calculate for himself their cost, as only a very small quantity is required to prevent inversion or deterioration of the sugar.

Of course in the tropics, where these chemicals are not to be had, the cost of carriage from Europe has to be taken into account. Peroxide of hydrogen can be made in the factory itself from peroxide of barium and sulphuric acid, a process which is so simple that any manufacturer can do it himself.

The writer is firmly of opinion that this process, on being

properly tried, will be found a perfectly rational one, and well suited for working every kind of sugar, as any deterioration or inversion of the sugar is excluded.

To give an idea as to the cost of refining for non-European manufactories it may be mentioned that in England the working expenses would be 3d. per cwt. of sugar.

The off-running syrups from the centrifugal machines are sent back into the melting pan and mixed with raw sugar, and again treated with chemicals, so that practically only white crystals result.

I have had many inquiries from India, Argentina, Brazil, Mexico, Peru, &c., where manufacturers are anxious to make sugar for consumption without any great outlay. To them this process is unhesitatingly recommended as a simple and eminently practical method. But it is of the utmost importance to stick implicitly to the directions given, and to follow them out exactly with regard to their execution.

Of course if cubes are desired, the crystals can easily be dissolved again, and worked according to the known and existing cubes processes, or ready crystals can be pressed into cubes. Powdered sugar, icing sugar, and the like may be made from the crystals resulting from this process.

I think this process is especially adapted for use in India, where the religion of the natives forbids the use of animal charcoal, and is the only one, refiners can adopt for the production of sugar convenient to the Indian market. In every country which has the advantage of manufacturing sugar for consumption from raw sugar, this process will enable the manufacturers to derive the greatest benefit in working.

It is impossible to give here any more details, but I think that the information supplied above should go far to answer the numerous direct and indirect inquiries on the subject.

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REPORT ON THE CULTIVATION OF PINEAPPLES AND OTHER PRODUCTS OF FLORIDA.

By Robert Thompson, of the Jamaica Board of Agriculture.

Having recently visited Florida, on account of Messrs. Elder, Dempster & Co., for the purpose of acquiring information to the methods of pineapple cultivation so successfully pursued in that State, I have the pleasure to report accordingly.

In addition to pineapples I embraced the opportunity of investigating other important cultures in Florida capable of being turned to good account in Jamaica.

The resourcefulness of the people there in developing new industries greatly impressed me throughout my trip. They have little beyond tropical sun and sand at their disposal.

For success they depend upon their characteristic energy, industry and perseverance. With these traits they transform the barren resources of the soil.

Before leaving for Florida, I called at Washington, where I had the honor of an interview with the Honorable James Wilson, Secretary of Agriculture in the Cabinet of Mr. McKinley (with the Secretary I may mention I had recently been in communication relative to the cultivation of new products). I was welcomed with the utmost consideration and introduced to the Chiefs of Bureaus of the Departmnet, eminent Specialists, who most generously placed at my disposal every source of information. Professor Webber, the well known expert in hybridization, prepared my itinerary with references to the leading cultivators in Florida, whom he thought might be most useful to me in my line of investigation. It is only necessary to say that the exceptional attention I received everywhere, placed me in a position to acquire valuable information. In this connection I wish to offer my sincere thanks to Professor B. T. Galloway, Chief of the Bureau of Plant Industry as well as to Professor Webber.

Orlando, the first pineapple region I visited, is situated on the most northern latitude at which pineapples are grown in Florida.

Until about 12 years ago the pineapples were cultivated in the open without protection, but the recurrent frosts rendered the cultivation too precarious, for the slightest touch of frost ruined a year's crop.

My references from Washington included one to the pioneer of a new system of pineapple cultivation. Acres of sheds were constructed by this pioneer (Mr. Russell) and he commanded success. This system of cultivation is now exclusively adopted at Orlando, partly to afford protection from frost and partly to screen the pineries from the burning sun. Thus numerous pineries, ranging in size from one to twelve acres, are closely boarded all round 7 to 8 feet high. At regular distances posts are placed some 12 feet apart, on which are fixed connecting rods; on these are placed narrow rafters, between each of which a space similar in width is left for the admission of light. Through these spaces the light is admitted in glittering rays of sunshine, ample, it is abundantly proved, for the well-being of the plants. A still more remarkable feature of cultivation is demonstrated under these sheds, one that further exemplifies the constitutional flexibility of this plant. During several months of winter when frost is dreaded, when every hour of night is watched for possible disaster by all concerned, the whole of this shed structure is covered with canvas, sometimes even with laths fitted in the interstices of the fixed roof laths, with the result that all the plants in the interior are shrouded in comparative darkness for several months. Within this covered roof when the

thermometer falls to about 40° in a two acre pinery a hundred fires are lighted, sometimes stoves. The smoke from the fires combats the frost, though the plants frequently suffer from the smoke.

In one instance last winter one of the best growers risked his one and a half acre pinery throughout the winter without using canvas. He experienced many a sleepless night, but there was no frost, and he said he had stolen a march upon his neighbors from the fact that his plants looked much better than those that were covered. However the other pineries that were darkened, bore crops just as well as his. Thus the dark treatment does not affect the accommodating powers of the plant.

The cultivation under sheds is a remarkable success, it is not only perfect garden cultivation, but it rivals the most skilfully conducted green-house cultivation. Nine thousand are planted to the acre, every plant practically speaking flourishes. It is not uncommon to see a pinery with 95 per cent. bearing fruit. The average is 80 per cent. The soil is an important factor. It is nearly all sand containing as it does from 96 to 98 per cent. of silica. The growers furnish all the food by fertilizers which bring forth luxuriant crops. The fertilizers are manipulated and applied with scientific precision, just what is desired to ensure complete productiveness.

There are altogether about 200 acres of cultivation under sheds. Large extensions are made annually. At the time of my visit there was one application for 100,000 suckers. A one-acre or a two-acre shed (and there are many such) is considered a lucrative investment for a small capitalist. The larger cultivators have sheds occupying from 5 to 12 acres each.

The cost of erecting sheds per acre averages fully $300, and for the canvas as much more. They last about 7 years. Suckers cost 10 cents each, 9,000 per acre ($900). The fertilizers cost about $100 per acre annually. Thus an acre costs fully $2,000 on the first crop. The first crop in about 20 months covers all expenses. The range of prices obtained is from 20 to 75 cents each. This is for "fancy" fruit, practically all Smooth Cayenne. The net profit is stated to be about 40 per cent. The leading cultivators net more than $3 per crate averaging 16 fruits. Some of the growers replant, after reaping each crop, some after two crops.

Throughout the year, even during the cool season, the sun shines with tropical brilliancy. During most of the year the temperature approximates to that experienced in Jamaica. During my stay it was higher than it is in Jamaica at any time. The average rainfall for 7 years has been 49 inches and it is evenly distributed.

The suckers are set in long beds usually with 7 in the cross rows 18 inches apart and from 22 to 24 inches between the

rows. The sandy soil is kept perfectly free from weeds by means of a scuffle hoe every fortnight, with which also the fertilizers are turned in two or three times a year. This hoe is worked from the passages on either side of the bed.

Notwithstanding the sandy character of the soil, forests of pine trees covered the land anterior to cultivation. Oak trees are also dispersed here and there. The inference to be drawn from the presence of these and other trees, is that there is more stamina in the soil than is apparent. However the tree roots penetrate to a considerable depth. Certain varieties of Peaches and Pears flourish in the open when fertilizers are applied. Maize is cultivated on selected spots and yields 15 bushels per acre. In most parts the sandy soil is very deep.

The fruiting season is affected by shed cultivation. Crops are obtained to some extent at the time desired by the cultivator according to the time of planting. The principal season is in August and September. A grower informed me that the "Smooth Cayenne has the great advantage of blooming at any time." The plants that bloom in the summer here produce finer fruit than the ones that bloom in the cool spring. The size of the crates used by the Florida Fancy Pineapple Association is 12 by 20 by 24 inches, number of fruit 10, 12, 14 and 16.

The growers claim that the fruit from the sheds is superior to that grown in the Azores under glass, where the same variety is cultivated. One grower had a fresh stock of suckers which he imported from the Azores for propagating purposes.

Jensen on the Indian River is situated much further south, about 27° on the east coast. Here are vast fields, many miles of solid cultivation. Altogether there are several thousand acres cultivated on either side of the railway. Perhaps there is no such concentrated area of equal extent under sugar cane cultivation in Jamaica.

The pioneer pineapple cultivator here, indeed the pioneer cultivator on the Peninsula of Florida, Captain Richards, gave me an historical account of his initial experiments; how he 18 years ago (at that time the district was a wilderness) brought the first schooner load containing 40,000 suckers from the Key Islands, how they failed except a limited number, as he knew not how to treat them in the changed conditions of soil. He returned to the Keys for another schooner load. He persevered amidst the greatest difficulties. Mosquitoes were awful, heads and faces had to be shielded by a netted contrivance. His first shipment to New York attracted great attention. A son is now a large grower, shipping from 8,000 to 10,000 crates per year (average per crate 30). This veteran is at present experimenting with pineapple wines, etc.

This is the greatest pineapple region in the world; about 200,000 crates containing six million fruits are shipped to the northern cities annually, and plantations are constantly being

extended. Practically all the plants cultivated are the Red Spanish variety. This variety is generally admitted to be inferior in quality to several others, but growers claim that "it is the hardiest, easiest to cultivate and best suited to varying conditions." The Jamaica Ripley is well known amongst growers and is considered the most luscious of fruits, but though repeatedly tried it has not been successfully cultivated. The Smooth Cayenne is cultivated in the open to a small extent but not quite satisfactorily .

For a long period of years frost was unknown here, but the calamitous freeze of 1894-1895, destroyed all the plantations and ruined most of the planters. However most of the growers were determined to resist all obstacles,—the class of men that make a nation prosperous. They obtained from the Keys and the Bahamas fresh supplies of suckers and made new plantations. Another freeze two years ago, much less severe than the previous one, committed considerable destruction; suckers sprang up from the ground this time. Some pineries suffered more than others. From year to year the growers live in terror of the return of this disaster, though they look forward to comparative exemption from frost upon their devoted culture.

The soil here is practically the same as that at Orlando. The soil is a mystery, chemically and physically; it is not known how pineapples can grow in soil which is practically devoid of plant food. "Just how it is that the pineapple can thrive in such soil that seems to be exceedingly deficient in all the necessary qualifications of good land has not been explained. It will probably be necessary to institute careful physiological experiments with the plant itself before the matter shall be thoroughly understood." Again I quote from the agricultural experiment station report "we have here a plant that increases in size during the period of greatest drought, when there may be no rains for 6, 8, and at times 10 weeks, in a soil containing 99.44 per cent, of insoluble residue!"

The average area of each pinery is from 20 to 60 acres. I noticed that the smaller areas were under much better cultivation than the larger. This is what might be expected, when it is remembered that a 60-acre pinery contains some 700,000 plants. Throughout these thousands of acres of pineries weeds are conspicuous by their absence. They are carefully suppressed in the early stage of cultivation. The plants are set about 18 to 22 inches apart, some 12,000 to the acre, including passages. This extremely close planting is considered advantageous.

It is claimed that this dense mass not only supports the plants and fruit, but that it prevents the growth of weeds. The first crop is obtained in about 20 months, and at this stage the fields present a fine symmetrical appearance. For

the second and subsequent crops, a couple of suckers are left to each plant; this aggregates into a dense mass of plants after the first crop is harvested, so much so that one wonders how the fruit is cropped. Each sucker yields a fruit, so that greatly augmented crops are obtained. From the period of planting the cultivation is kept up from 8 to 10 years. I noted that they passed their prime in 4 years, hence frequent replanting would be better, but a crop at least is lost by replanting, and when they are densely massed a touch of frost affects them less than it does those wider apart. The 12,000 plants per acre are estimated to yield from 8,000 to 9,000 fruit per acre. These with the additional suckers yield from 9,000 up to as many as 15,000 per acre. I have frequently counted 8 and 10 fruits on a square yard. One man reaped 600 crates per acre this year, though some growers got less than 200 crates per acre, and this may be put down as the general average.

The great bulk of the crop is harvested in June. Last June the growers were unfortunate in having heavy rains (17 inches) which affected the keeping quality of a considerable number of fruits. Not long before they experienced a drought, the fruit was smaller on this account. The fruit when packed is sent by rail to Jacksonville, the great distributing center of Florida,—one day for this. They are then transferred to other trains for the north,—3 days more. When packed in the trains, a space is left between the crates for ventilation.

The standard size of the crate is 10½x12x36 inches, two divisions. A crate holds 18 large fruits, next sizes 24, 30, 36, 42 and 48. Average size 30. The 48's are so small that they are hardly worth shipping. Before packing each fruit is wrapped with paper.

The average amount netted per acre is about $400. "We have had from one acre of pines containing 10,000 plants 250 crates averaging 30 to the crate, or 7,500 pineapples, netting us over transportation, commission, etc., $2 per crate or $500 for the acre." Others state that 100 per cent profit is realized.

Besides the open system of pineapple cultivation so extensively carried on here, the Orlando shed system has been inaugurated since the great freeze of 1895, and so successfully that there is already about the same area of sheds as at Orlando, about 200 acres, and they are in point of size much larger here. Dozens of acres are being extended at a cost of more than $300 per acre. Peaches thrive in the sheds but not outside. The Jensen (Indian River) growers cultivate the red spanish pine under sheds in contra-distinction to the Orlando growers with their smooth cayenne. As already stated frosts are less frequent and less severe than at Orlando but the temperature falls to danger point under 40° from time to time, when the plants begin to suffer. No canvas covering

or fires are used here. It is found that on a cold morning the sheds conserve the temperature to the extent of a few degrees. This is important in itself, but other great advantages accrue by the adoption of this great plant growing contrivance. The Red Spanish plants grow far more luxuriantly therein, the fruit is one-third larger and it is decidedly improved in flavor, and the plants are cultivated with considerably less fertilizing ingredients. Fruit burning is also obviated. Careful observation of the open fields and of the shedded fields side by side, conclusively prove the far greater luxuriance and more perfect cultivation under the latter. The adoption of this system of cultivation is quite as important for the Red Spanish variety as it is for the Smooth Cayenne.

The shed method has thus brought to light new cultural possibilities of the pineapple. Darkness during several months of winter at Orlando does not interfere with the perfect cultivation of the plant. Interrupted sunshine throughout the year by means of sheds for both varieties, enhances the luxuriance, productiveness, size and flavor of the fruit, and the cost of fertilizing is materially reduced thereby. One great grower to whom I was referred by the Department of Agriculture informed me in the presence of another leading grower, that if he had from the first, confined his attention to 10 acres of sheds, he could have done better than by cultivating 60 acres in the open. Most of his cultivation is now under sheds. And the consensus of opinion is markedly in favor of shed culture. The same grower declared that more money is made out of the Red Spanish, than from the fancy fruit at Orlando, the demand for them being infinitely greater by reason of cheapness.

Oranges too, succeed perfectly in sheds, but the lofty structures requisite are very expensive. I have seen dozen of acres. Horticulturally the system ensures the most vigorous development of plants. At the great hotels at Palm Beach, etc., ornamental plants are extensively cultivated in sheds. A notable instance of the importance of shed cultivation was expounded to me at Washington on my return from Florida. One of the experts at the Agricultural Department thus called my attention to the fact that in the vicinity of Tampa on the west coast the shed system for cultivating tobacco is adopted with remarkable results, both as to quality and quantity "the crop is so valuable that the land is now covered with cheese cloth placed on wood frames 9 feet high." In Jamaica, under sheds tobacco may become an important industry. The quantity per acre would be greatly augmented as well as improved in quality, and it can be grown in places where it cannot be grown successfully without sheds.

The conclusions I arrived at with regard to the actual benefit conferred on plants by the adoption of shed cultiva-

tion are as follows: It mitigates the fierce burning rays of a tropical sun upon plant life. It prevents continuous and excessive evaporation. It interrupts the force of winds which conduces to increased evaporation and aridity.

PINEAPPLES ON THE FLORIDA KEYS.—From the port of Miami 25° 70′ I proceeded in a schooner to Elliott Key, and Key Largo, the latter about 25° 20′ to examine the methods of cultivation adopted there. Hundreds of acres are under cultivation on these islands since about 1860 when they were introduced. On the keys an absolutely different system of cultivation is carried on. The plants are grown among the coralline rocks, between the crevices, the crow bar being used to open the crevices for the plants. The vegetation on the rocks consists of small scrubby trees. This is cut down and burnt. An inch or two of decayed vegetable matter covers most of the rocks. About a year after clearing this soil is completely washed into the crevices so that on some plantations earth is invisible, the entire surface being rock difficult to walk over. In other places there are small collections of humus interspersed among the rocks. The suckers are actually planted to the extent of 1,500 dozens to the acre (18,000). The cultivation of each pinery is kept up about 5 years. Fertilizers are not used. The cultivators have the great advantage of having their fruit a few weeks earlier in the market, than those cultivated on the mainland and consequently realize a higher price. There can be little doubt that the earlier crop, arises from the high temperature emanated by the rock.

HYBRID PINEAPPLES.—During my interview with Professor Webber, the eminent Chief of Hybridization at Washington, on my way to Florida, I had the gratification of seeing the first hybrid pineapple fruit. The first product of a new type of pineapple; the result of many years of devoted skill; a new departure in the history of this fruit. This precious specimen created intense interest.

On my return to Washington from Florida, I was informed by the Chief of the Bureau of Plant Industry, by this time other hybrid fruits each distinctly different had been received from the experiment station in Florida; that the flavor of several of the types was extremely satisfactory.

At Miami I visited the Government Experiment Station where these fruits were grown, and saw the plant that gave the first fruit; there are about 300 hybrid plants altogether. Over a dozen had ripened fruit by the middle of July, and many more were coming to mautrity. Each plant so far yields distinctly different forms, so that they will be numerous. Some of course will be superior to others. Those that have fruited are producing suckers for multiplication. It is also interesting to record the fact that many of these plants are smooth leaved, spineless, an important consideration from

the grower's point of view, for it enables him to traverse his fields with great facility as compared with struggling through the spiny masses of leaves. It is further interesting to relate that the acquisition of smooth foliage was preconceived in the hybridizing operations, in view of its advantageous results. It was a source of pleasure to me to behold these precious achievements. In the near future we shall obtain specimens; for it may not be amiss to say, the chief of the bureau offered me most generously everything that can be spared by the department. There can be no doubt that these important acquisitions are destined to advance the pineapple industry and extend its popularity everywhere.

I am glad to say I have received seeds from another source of rare varieties which I have sown and hope to grow for further experimental purposes.

At the station mentioned there are also many new types of hybridized oranges the merits of which are as yet unknown, not having borne fruit. Guavas are also hybridized here and many other tropical plants are experimented upon.

ORANGES.—I visited according to arrangements made at Washington a great orange nursery at Glen St. Mary, about 30 miles from Jacksonville. Many millions of plants have been propagated here. There are here about half a million plants comprising all the best varieties of citrus fruits. The proprietor is a well known expert. Orange cultivation prior to the great freeze of 1895, was the greatest industry of Florida, it was the chief "wealth producer" extending over an immense area to the south of Jacksonville. Previous to that great disaster that ruined thousands of families, this region was extolled as the most congenial in Florida for oranges for it is recognized by most leading growers that the further north even to "danger point" they grow the more luscious is the fruit. This tallies with our cultivation on the hills. Another frost 2 years ago destroyed the groves connected with this nursery, the trees being frozen to the ground. Thousands of groves were also destroyed by that morning's frost over hundreds of miles of land. Many of the growers are now planting further south in order to escape the frosts. Since last frozen the trees have sprung anew from the bases of the trunks and they now present a splendid appearance having attained a height of seven or eight feet. Several stems are allowed to grow from the base,—most luxuriant stems, branches and foliage. Next year innumerable trees are expected to yield considerable crops. Only a few severe freezes have occurred in about 60 years.

In this extensive nursery thousands of small plants budded two years ago yield from 20 to 40 fruits each. I suggested that many hundreds of small trees could be grown to the acre for early cropping. These precocious trees are budded on citrus trifoliata stock. Pears, peaches and plums are com-

monly cultivated side by side with the orange. Many of the groves in the great orange region of Orlando that were less severely injured by frost are now in a flourishing condition, far finer trees than any in Jamaica. This is another example of the capability of a sandy soil, in which they are made to flourish by constant care and fertilizers.

At this nursery I witnessed a new departure in orange cultivation. A considerable number of plants are under experimental treatment for the Department of Agriculture at Washington, plants that were hybridized a few years ago. There are at least 50 very distinct forms, distinguishable by foliage, etc. These are about 8 feet high, and some of them are likely to fruit next year for the first time. At Miami a few hundred miles further south I also saw duplicates of these new forms at the Government Experiment Station, but much smaller plants. Varieties that will endure more frosts as well as superior in point of quality are anticipated from these hybridized types.

In the orange plantation connected with this nursery my attention was directed to great piles of logs between some of the wide rows of trees. I was surprised to learn that these piles are placed in summer in readiness for the winter frost. When the temperature falls seriously the huge piles of wood are set on fire to repel the frost by means of smoke; this in the open air. The result is usually satisfactory.

Orange groves I noted everywhere are peculiarly sensitive to bad cultivation, that is by allowing weeds to grow, by withholding fertilizers, by insufficient cultivation. Wherever neglected, they languish.

The ownership of a ten-acre grove has been and is still looked forward to as ample to provide all the comforts of a well-to-do family. Each tree is highly prized, for on arriving at maturity it is valued at from $15 to $25. "In an orange grove 8 to 10 years old $1,000 per acre has often been realized."

Ordinary manure is deprecated "the benefits of barn manure in an average grove are in serious question. The fruits produced by nitrogen from this source are, as above stated usually large, coarse, thick skinned, with abundant rag and of inferior flavor."

My attention was repeatedly called to the notorious manner in which oranges are packed in Jamaica. Frequently trained packers have been selected in Orlando, sent a few days journey to New York or Baltimore at great expense and besides paid $2 a day to rehandle orange shipments from Jamaica, that is to size, pick and repack in boxes for distribution.

Orange growers and dealers freely express their surprise at this incredible example of Jamaican incompetency. For be it remembered that the splendid quality of the fruit itself is

depreciated. "Fruit which is well known by a brand will often sell readily and quickly for 50 per cent more than other fruit equally as good, but not known to be so by the buyer."

Orange and grape fruit groves are being largely planted in the vicinity of Miami. Plants three years old budded on small lemon stock yield 100 fruit. The size and luxuriance of the foliage is remarkable. Several of the most successful growers informed me that they did not know 10 years ago the difference between an oak and an orange tree. With determined energy and enthusiasm they have become noted cultivators.

Before the 1895 freeze five million crates of oranges were shipped from Florida valued at about fifteen million dollars. After the freeze the number of crates fell to 100,000. Last year it increased to 750,000 and next season double the latter number are expected. California produces six million crates.

In a conservatory at Washington the most famous of all orange trees was pointed out to me, the original plant of the navel variety from which by propagation about half of the orange crop of California has originated. Californians commonly salute this wonderful tree.

Since my return from Florida I have visited the parish of Manchester, the chief center of orange production in Jamaica, more than half of all that are shipped coming from here. One firm alone collects and ships about 100,000 barrels a year.

Great benefit has accrued to Jamaica by the naturalization of plants introduced hundreds of years ago. Thus logwood and oranges have spontaneously overrun hundreds of miles of the island and the former has long been established as one of the staple products. The spontaneous diffusion of a species of plant affords abundant proof of the eligibility of the environments in which it grows. Innumerable orange trees are thus widely disseminated in Manchester. Intermingled with other forest trees they have been subject to severe conditions of existence. Thus they present a dwarf stunted aspect. Practically the only attempt at cultivation has been to destroy the native trees by which they are surrounded with the result that small crops are obtainable. From these semi-wild trees thus reclaimed from the forest the average yield is less than half a barrel each. A little attention is sometimes bestowed upon groups of trees. For instance trees occur on the settlers' coffee fields which have to be regularly weeded. Here they occasionally yield several barrels each and they present a distinctly improved appearance. One of the settlers pointed out a considerable group of trees he obtained on land he purchased. A few years ago his first crop was sold for 3 shillings, the following year he had 6 barrels and in the two subsequent years 14 and 62 barrels respectively.

The trees are very unequally distributed; in many places from 20 to 60 may be counted on an acre—occupying but a

small portion thereof. Commonly from 6 to 12 of these dwarf trees are crowded in a space equal to that allotted to a single tree in Florida.

The Manchester oranges are excellent in point of quality, They are sold at 2 shillings per barrel of about 400 fruits. If they were carefully handled, sized, etc., and packed in boxes the value would be greatly enhanced.

It is interesting to note that several gentlemen in this parish are initiating the cultivation of budded trees with very promising results. I strongly recommend medium-sized wild trees as the best stock for budding purposes. This can be done on a large scale.

The cultivation of coffee in Manchester is a large industry among the small-settlers. The profit realizable can hardly exceed £2 per acre. If the same cultural attention were paid to the cultivation of oranges the returns would be surprising. Instead of an acre, containing irregular groups of desolate orange trees aggregating some 30 to 60, from which 20 barrels may be obtained, 150 of these small trees could be established per acre by the simple process of transplantation. By higher cultivation than that applied to coffee 300 barrels of oranges would be assured per acre. On the lines I have propounded orange cultivation is capable of becoming one of the great industries of the island.

There are numerous decayed or worn out trees that should be destroyed and replaced by healthy medium-sized trees. Better to cut the transplanted trees well back to induce new and vigorous growth.

In the delightful climate of the Port Royal Mountains this tree yields the very best possible fruit. Thousands of acres could be cultivated in lieu of thousands of trees as at present. The moderate application of fertilizers would ensure splendid returns where the soil is not sufficiently rich, this applies to all parts of the island. All the conditions referred to emphasize our pre-eminent orange growing capabilities, capabilities such as throw into the shade all Florida that culminated with returns valued at fifteen million dollars. Our illimitable resources await enterprising Englishmen to embark in orange growing.

Limes grow with perfect success, double the size of those that grow on the keys of Florida. On rocky land hundreds of thousands of lime trees could be established at a trifling cost.

CASSAVA CULTIVATION.

It is an interesting fact that Orlando, (in Florida) the home of the pineapple shed system of cultivation, is indebted to Jamaica for an important industry. About three years ago an American tourist in Jamaica, Mr. Perkins, was struck with the value of cassava as a starch-yielding plant. On his re-

turn to Florida he organized a company and erected a great factory at Lake Mary, 18 miles from Orlando, for the manufacture of cassava starch. I visited the factory at the end of June and was kindly permitted to see through it, the managers taking a great interest in Jamaica. One thousand acres of cassava are cultivated in the vicinity, hundreds of acres of which by gentlemen connected with the factory. There are fields of one hundred acres each which I had the pleasure of inspecting. Within 60 miles of the factory the managers purchase the tubers delivered at railway stations at $5 per ton, and the culture is extending rapidly. This factory crushes 40 to 50 tons of tubers daily during the cropping season of 4 months. The average crop per acre is 9 tons. This plant grows remarkably well on the all present sandy soil. On the day of my visit to a 100-acre field fertilizers were applied to the field, to the value of $500. I pointed out that larger returns would be obtainable from a better soil, in fact double the crop. The yield of starch from the tuber is from 17 to 20 per cent. It is also noteworthy that the manufacture of tapioca and dextrine from cassava are to be taken up with the least possible delay.

The colored laborers employed in this cultivation are paid $1 a day. From the planting to harvest seven months are requisite. On account of the winter frosts the seed (stem cuttings) has to be buried in the sand for several months. Great piles of them are thus covered during winter. The cost of preparing the land for this cultivation is $40 per acre. This for digging up the Palmetto roots which cover the land.

I quote the following from a Savannah newspaper of June 29th, 1901, relative to this cassava factory: "Brunswick's Board of Trade held an interesting meeting today to hear an informal address from President Perkins of the Florida Starch Factory, and for a lengthy session President Perkins entertained a large attendance. President Perkins is en route to the north, where he will study the needs of various cotton factories in their use of starch, and will still further adapt his factory to the manufacture of products suited to them. At present his firm has about $100,000 invested in the development of the cassava industry and the enlargement of their plant is one of the near by plans."

During my sojourn in Florida, I collected other valuable information regarding cassava as an article of food for cattle, etc. Indeed Florida is determined to make cassava a leading staple product. The matter is discussed everywhere.

From the report of the professor at the Florida Agricultural Experiment Station I make the following etxracts: "With all the facts procurable, and with the experience not only of myself, but many practical farmers to support the opinion, I have reached the conclusion that, all things considered, cassava comes nearer furnishing the Florida farmer

with a more universally profitable crop than any other which he can grow on equally large areas. It can be utilized in more ways, can be sold in more different forms, can be more cheaply converted into staple and finished products and can be produced for a smaller part of its selling price than any other crop.

"It is unquestionably true that cassava, all things considered, comes nearer supplying a perfect ration for farm stock than any other concentrated food produced upon Florida farms.

"Every beef animal in Florida can be put in the condition of western stall-fed cattle by the simple use of cassava at a mere fraction of the cost of the corn feeders of the west.

"An acre yielding 40 bushels of corn would at this rate produce 1,187 pounds of starch, while an acre of cassava producing 6 tons would yield 2,400 pounds of starch.

"It thus appears that cassava is today the cheapest known source of starch, costing at present market values of raw material only about one-fourth as much as its nearest competitor.

"Not only therefore, does the high yield of starch in cassava place it prominently before manufacturers as a probable new material for the great glucose industry, at present practically dependent upon corn, but moreover cassava contains two other constituents worthy of consideration in this connection, namely, its 3 per cent. of sugar, against the 0.4 per cent. in corn and 1.68 per cent. of fibre, as compared with 2.20 per cent. of corn.

"Manufacturers are now considering the importance of these facts, and there is good reason for expecting the erection of at least two glucose factories in the near future, which will depend upon cassava for their raw material."

The same authority says in another report: "The actual profit on the feeding of the cassava steers was 48.42 per cent. on the investment. The cotton seed steers returned a profit of 37.43 per cent., and the corn fed steers 14.98 per cent. The difference between lots 1 and 2 is decidedly apparent and shows cassava to be very materially the cheapest and best ration which can be used for fattening purposes. The most astonishing fact, however, is the very great difference demonstrated between the cost and the results of feeding corn and feeding cassava, the difference being almost two-thirds in favor of the latter.

"Cassava proves itself a most superior beef fattening food. The cost of live weight beef produced by feeding cassava is 1.1 cents per pound, and in 75 days a profit of 59.10 per cent. was made by fattening beef upon cassava."

Halfway Tree, Jamaica, August 27th, 1901.

"WHAR DEW I CUM IN?"

"Thar's a mighty lot er talkin' about farmers 'n thar rights,
'N the wonderful prosperity that beet growin' invites.
Thar's a heap er foolish crowin' 'n the 'beats' begin ter shout
'N holler fer the Tariff ter keep free raw sugar out!
But I notis thet the beet-producing farms are very few,
An' the farmers through the country aint got much ef it ter dew.
The hull land aint a-raisin' beets, 'n aint goin' ter begin,
Beet growin's right fer sum, I guess—but, whar dew I cum in?

"The farmer gits four dollars now fer every ton o' beets—
A hansom price, I must allow—but hidin' sum deceits.
Beet sugar manyfacterers admit es they hev found
Thet 'granylated' costs 'em sumthin' like three cents a pound.
In fact, thet leaves a profit on which they'd greatly thrive—
And—if it kin be sold fer three, why should we pay 'em five?
It seems ter me es thet's a game thet's mighty like a skin—
But—if thar's any benefit—waal,—whar dew I cum in?

"When Uncle Sam's in want o' cash, we're glad ter help him out,
'N we'll stand all the taxes thet are needed, never doubt;
But when his pocket-book's well lined, an' nary cent he lacks,
Et seems ter me his duty's ter repeal thet sugar tax.
Them fellers wot is interested sez it's ter protect
The beet-producin' farmer thet the duty they collect;
But I guess thet explanation es a little bit too thin—
The sugar-maker,—he's all right;—but—whar dew we cum in?

—Arizona Kicker.

———:o:———

In frozen meats the Australian States are already cutting a large figure in the world's commerce. No less than thirty refrigerating steamers, with a carrying capacity of nearly 2,000,000 carcasses, are now running regularly between New Zealand and London, and about seventy more with a similar capacity between Australia and British ports. Between 1882, when the trade started, and 1896-7 the frozen meat shipments jumped from 1,500,000 pounds' weight to over 150,000,000 pounds for New Zealand.—Ex.

Sugar, although not a great success in Madagascar, is by no means a failure, says Mr. Acting Vice-Consul F. W. Turner. It has been said that after a short time the fertility of the Malagasy soil begins to wane when planted with sugar cane, and needs to be artificially renewed, but this is the case in other sugar-growing countries, Mauritius, notably, for instance. Alcohol is distilled from the native sugar up to 85 degrees (French).

HONOLULU STOCK AND BOND EXCHANGE, APR. 16, 1902.

STOCK	Capital Authorized	Shares Issued	Capital Paid up	Par Value	Last Sale
MERCANTILE					
C. Brewer & Co	$ 1,000,000	10,000	$ 1,000,000	$ 100	415
N. S. Sachs' Dry G'ds Co. L'd.	60,000	600	.....	100	100
L. B. Kerr & Co., Ltd	200,000	4,000	.....	50	
SUGAR					
Ewa Plantation Company	5,000,000	250,000	5,000,000	20	24
Hawaiian Agricultural Co	1,000,000	10,000	1,000,000	100	270
Hawaiian Com'l & Sugar Co.	10,000,000	100,000	2,312,750	100	80
Hawaiian Sugar Company	2,000,000	100,000	2,000,000	20	25
Honomu Sugar Company	750,000	7,500	750,000	100	130
Honokaa Sugar Company	2,000,000	100,000	2,000,000	20	11
Haiku Sugar Company	500,000	5,000	500,000	100	.....
Kahuku Plantation Company	500,000	25,000	500,000	20	24
Kihei Plant. Co. Ltd.,	2,500,000	50,000	2,500,000	50	10½
Kipahulu Sugar Company	160,000	1,600	160,000	100	....
Koloa Sugar Company	500,000	5,000	500,000	100	164
McBryde Sug. Co. Ltd.	3,500,000	175,000	3,500,000	20	5½
Oahu Sugar Co	3,600,000	36,000	3,600,000	100	90
Onomea Sugar Co	1,000,000	50,000	1,000,000	20	24½
Ookala Sugar Plantation Co.	500,000	25,000	500,000	20	8
Olaa Sugar Co. Ltd., Assess.	2,500,000	125,000	865,000	20	5¼
Olaa Sugar Co. Ltd., Paid up	2,500,000	125,000	2,500,000	20	13
Olowalu Company	150,000	1,500	150,000	100	.....
Paauhau Sug. Plantation Co.	5,000,000	100,000	5,000,000	50	.....
Pacific Sugar Mill	500,000	5,000	500,000	100	.....
Paia Plantation Company	750,000	7,500	750,000	100	250
Pepeekeo Sugar Company	750,000	7,500	750,000	100	.....
Pioneer Mill Company	2,250,000	22,500	2,250,000	100	100
Waialua Agricultural Co	4,500,000	45,000	4,500,000	100	53½
Wailuku Sugar Company	700,000	7,000	700,000	100	370
Waimanalo Sugar Company	250,000	250,000	250,000	100	160
Waimea Mill Company	125,000	125,000	125,000	100	87
MISCELLANEOUS					
Wilder Steamship Company	500,000	5,000	500,000	100	100
Inter-Island Steam Nav. Co.	600,000	6,000	600,000	100	100
Hawaiian Electric Company	500,000	5,000	500,000	100	110
Honolulu R. T. & Land Co	250,000	2,500	250,000	100	90
Mutual Telephone Company	150,000	13,900	139,000	10	10
Oahu Railway & Land Co	4,000,000	40,000	4,000,000	100	90
BANKS					
First National Bank	500,000	5,000	500,000	100	.....
First Am. Sav. B. & Trust Co.	250,000	2,500	250,000	100	.....
BONDS	Amt. of Issue				
Hawaiian Govt. 5 per cent	1,251,200	Dec. 31, 1900	.....	.....	97¼
Hilo Railroad Co., 6 per cent	1,000,000	750,000	.....	.....	.....
Hono. R. T. & L. Co , 6 p. c.	300,000	.....	.....	.....	.....
Ewa Plantation 6 per cent	500,000	.....	.....	.....	101
Oahu Railway & L'd Co. 6 p. c.	2,000,000	.....	.....	.....	104½
Oahu Plantation 6 per cent	750,000	.....	.....	.....	100
Olaa Plantation 6 per cent	1,250,000	.....	.....	.....	.....
Waialua Agr. 6 per cent	1,000,000	.....	.....	.....	101

PLANTATION DIRECTORY.

Island and Name.		Manager.	Post Office
OAHU.			
EwaPlantation Co	*	G. F. Renton	Honouliuli
Waianae Sugar Co. Ltd	***	Fred Meyer	Waianai
Waialua Agricultural Co	*	W. W. Goodale	Waialua
Kahuku Plantation Co	xx	Andrew Adams	Kahuku
Waimanalo Sugar Co	**	G. C. Chalmers	Waimanalo
Oahu Plantation Co	x	Aug. Ahrens	Waipahu
Honolulu Sugar Co	**	J. A. Low	Aiea
Hecia Agricultural Co. Ltd	*x*	W. W. McGowan	Hecia
Laie Plantation	x*x	S. E. Wooley	Laie
MAUI.			
Olowalu Sugas Co	**	E. Kruse	Lahaina
Pioneer Mill Co	x	L. Barckausen	Lahaina
Wailuku Sugar Co	**x	C. B. Wells	Wailuku
Hawaiian Commercial & Sugar Co	x*	H. P. Baldwin	Spreckiesville
Paia Plantation	x"	D. C. Lindsay	Paia
Haiku Sugar Co	x*	H. A Baldwin	Hamakuapoko
Hana Plantation	xx	K. S. Gjerdrum	Hana
Hamoa Plantation	*'x	J. R. Myers	Hamoa
Kipahulu Sugar Co	x	A. Gross	Kipahulu
Kihei Plantation	x*	James Scott	Kiuei
Maui Sugar Co	†	W. S. Akana	Huelo
HAWAII.			
Paauhau Plantation	**	Jas. Gibb	Honokaa
Hamakua Mill Co	*x	A. Lidgate	Paauilo
Kukaiau Plantation	x	J. M. Horner	Paauilo
Kukaiau Mill Co	*x	E. Madden	Paaulio
Ookala Sugar Co	**x	W. G. Walker	Ookala
Laupahoehoe Sugar Co	*x	C. McLennan	Papaaloa
Hakalau Plantation	**	Geo. Ross.	Hakalau
Honomu Sugar Co	**x	Wm. Pullar	Honomu
Pepeekeo Sugar Co	*x	H. Deacon	Pepeekeo
Onomea Sugar Co	**x	J. T. Moir	Papaikou
Hilo Sugar Co	**	J. A. Scott	Hilo
Hawaii Mill Co	x	W. von Graevemeyer	Hilo
Waiakea Mill Co	*x	C. C. Kennedy	Hilo
Hawaiian Agricultural Co	*'x	C. M. Walton	Pahala
Hutchinson Sugar Plantation Co	**	G. C. Hewitt	Naalehu
Union Mill Co	*x	Jas. Renton	Kohala
Kohala Sugar Co	*	E. E. Olding	Kohala
Pacific Sugar Mill	x**	D. Forbes	Kukuihaele
Honokaa Sugar Co	x**	Jno. Watt	Honokaa
Kona Sugar Co	xxx	J. Cowan	Holualoa
Olaa Sugar Co	xx*	F. B. McStocker	Olaa
Puna Sugar Co	xx*	W. H. Campbell	Kapoho
Halawa Plantation	x*x	P. S Kay	Kohala
C. F. Hart, (Niulii)	*x	R. Hall	Kohala
Hawi Mill & Plantation	††	John Hind	Kohala
KAUAI.			
Kilauea Sugar Co	**	G. R. Ewart	Kilauea
Gay & Robinson	x*x	Gay & Robinson	Makaweli
Makee Sugar Co	**x	G. H. Fairchild	Kealia
Grove Farm Plantation	x	G. N. Wilcox	Lihue
Lihue Plantation Co	x	F. Weber	Lihue
Koloa Sugar Co	x	P. McLain	Koloa
McBryde Sugar Co	*x	W. Stodart	Eleele
Hawaiian Sugar Co	x'	W. A. Baldwin	Makaweli
Waimea Sugar Mill Co	*	J. Fassoth	Waimea
Kekaha Sugar Co	x	H. B. Faye	Kekaha

Key	Honolulu Agents	
*	Castle & Cooke	(4)
**	W. G. Irwin & Co	(8)
***	J. M. Dowsett	(1)
x	H. Hackfeld & Co	(9)
xx	M. S. Grinbaum & Co	(2)
xxx	McChesney & Sons	(1)
*x	T. H. Davies & Co	(8)
**x	C Brewer & Co	(7)
x*	Alexander & Baldwin	(5)
x**	F. A. Schaefer & Co	(2)
xx*	B. F. Dillingham & Co	(2)
x*x	H. Waterhouse & Co	(3)
x	C. Bolte	(1)
†	Wong Kwai	(1)
††	Hind, Rolph & Co	(1)